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CARBON FINANCIAL ACCOUNTING:

EVALUATING THE "DISCIPLINARIAN EFFECT" OF STANDARDS AND MARKETS ON DISCLOSURE PRACTICES OF EU-15 LISTED FIRMS

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Biographical Note

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Her main scientific area of research is International Financial Accounting. In April 2013, a research paper entitled "Carbon Financial Accounting: Evaluating the convergence of practices among EU-15 listed firms", was presented at the International Conference for Critical Accounting, New York, co-authored by Doctor Patrícia Teixeira Lopes.

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Abstract

In 2005, the European Union (EU) launched the European Emissions Trading System for greenhouse gases (GHG). Since then, however, EU-15 firms under IFRS have no mandatory regime on accounting for GHG emission allowances. The only exception is Spain, where domestic guidance on emissions trading schemes is compulsory to entities linked to the Spanish allowances allocation plan, regardless if they draw up their financial statements under national GAAP or under IFRS.

Prior literature suggests that harmonization of international accounting practices may arise from two different forces: institutional endeavors to harmonize international financial reporting standards; and, voluntary movements by firms acting internationally towards similar accounting practices, regardless the harmonization of accounting regulations. Building on this background, the aim of this study is twofold: to confirm the existence of a "disciplinarian effect" of accounting standards and, to test the existence of a "disciplinarian effect" of markets, both concerning *disclosure on GHG emission allowances in the annual accounts* (carbon financial disclosure). To that end, it was considered either the harmony in, or the level of disclosure provided, from 2005 to 2012, by 168 listed firms based in the EU-15. To measure the level of disclosure, a disclosure index was constructed. To measure harmony in disclosure, T indices (Taplin, 2004) were applied.

Results confirm the "disciplinarian effect" of accounting standards by significantly enhancing both the harmony in, and the level of carbon financial disclosure. Otherwise, the markets do not seem to exert, by itself, a "disciplinarian effect" over disclosure. Extending the hypotheses formulated by Oliver (1991) to an international environment, this study suggests that, in view of multiplicity and fragmentation of foreign stakeholders, EU-15 listed firms that operate in foreign markets tend to respond primarily to domestic institutional pressures from which organizational dependencies, particularly as regards the allocation of allowances and the control of GHG emissions, are perceived as higher. Accordingly, their disclosure strategies are ultimately driven by the accounting guidance in home-country, required, or not, for entities under IFRS.

Key words: Carbon financial disclosure, harmonization of disclosure practices, accounting standards, internationalization, institutional theory.
JEL Classification: M41, M48.

Resumo

Em 2005, a União Europeia (UE) iniciou o sistema europeu de comércio de licenças de emissão de gases com efeito de estufa (GEE). Desde então, no entanto, as empresas da UE-15 que aplicam normas internacionais de contabilidade (IFRS) não estão sujeitas a qualquer regime obrigatório para o relato financeiro de licenças de emissão. A única exceção é Espanha, onde o normativo nacional é vinculativo para todas as entidades ligadas ao plano espanhol de atribuição de licenças, independentemente de elaborarem demonstrações financeiras segundo normas nacionais ou IFRS.

A literatura sugere que a harmonização das práticas contabilísticas internacionais pode ser induzida por duas forças diferentes: esforços institucionais para harmonizar as normas internacionais de contabilidade; e movimentos voluntários por parte das empresas que atuam internacionalmente, adotando práticas similares independentemente da harmonização das normas contabilísticas. Neste contexto, o objetivo deste estudo é duplo: confirmar o "efeito disciplinador" das normas; e testar o "efeito disciplinador" dos mercados, relativamente à *divulgação de licenças de emissão de GEE nas contas anuais* (divulgação financeira de carbono). Para isso, foi analisada quer a harmonia, quer o nível da divulgação prestada, de 2005 a 2012, por 168 empresas cotadas sediadas na UE-15. Para medir o nível de divulgação, foi construído um índice de divulgação. Para medir a harmonia na divulgação, foi usado o índice T (Taplin, 2004).

Os resultados confirmam o "efeito disciplinador" das normas, aumentando significativamente, quer a harmonia, quer o nível da divulgação financeira de carbono. Ao contrário, os mercados não parecem exercer, por si só, um "efeito disciplinador" sobre a divulgação. Estendendo as hipóteses formuladas por Oliver (1991) a um ambiente internacional, este estudo sugere que, perante a multiplicidade e fragmentação dos *stakeholders* estrangeiros, as empresas cotadas da UE-15 que atuam em mercados externos tendem a responder primordialmente às pressões institucionais domésticas face às quais as dependências organizacionais, designadamente quanto à atribuição de licenças e ao controlo das emissões de GEE, são percebidas como mais elevadas. Assim, as suas estratégias de divulgação são essencialmente determinadas pelas normas contabilísticas do país de origem, obrigatórias, ou não, para entidades a relatar em IFRS.

Palavras-chave: Divulgação financeira de carbono, harmonização das práticas de divulgação, normas de contabilidade, internacionalização, teoria institucional.
Classificação JEL: M41, M48.

List of abbreviations

AFRAC	Austrian Financial Reporting and Auditing Committee
AICPA	American Institute of Certified Public Accountants
ANC	*Autorité des Normes Comptables* (France)
CDP	Carbon Disclosure Project
CER	Certified Emission Reduction
CME	Coordinated Market Economies
CO2	Carbon Dioxide
CoS	Cost of Settlement
CU	Currency Units
DM	Disclosure Method
EASAC	European Academies Science Advisory Council
EC	European Commission
EEA	European Environment Agency
EGRAG	European Financial Reporting Advisory Group
ERSE	*Entidade Reguladora dos Serviços Energéticos*
ERU	Emission Reduction Unit
ETS	Emissions Trading Schemes
EU	European Union
EU-ETS	European Union Emissions Trading System
FEE	Fédération des Experts Comptables Européens
FML	Full Maximum Likelihood
GAAP	Generally Accepted Accounting Principles
GEE	*Gases com Efeito de Estufa*
GHG	Greenhouse Gases
GRI	Global Reporting Initiative
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IASC	International Accounting Standards Committee
ICAC	*Instituto de Contabilidad y Auditoría de Cuentas* (Spain)
IDW	Institute of Public Auditors (Germany)
IETA	International Emissions Trading Association

IFRIC	International Financial Reporting Interpretations Committee
IFRS	International Financial Reporting Standards
KHT	Finnish Institute of Authorized Public Accountants
LME	Liberal Market Economies
LR	Likelihood Ratio
ML	Maximum Likelihood
MME	Mediterranean or Mixed Market Economies
NAP	National Allocation Plan
NCRF	*Normas Contabilísticas e de Relato Financeiro*
ND	Not Disclosed
NLA	Net Liability Approach
PhU	Physical Units (CO2 tones)
PwC	PricewaterhouseCoopers
RML	Restricted Maximum Likelihood
SEC	US Securities and Exchange Commission
UK	United Kingdom
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
US	United States of America
WMW	Wilcoxon-Mann-Whitney

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1. Introduction

The globalization of capital markets underlined the need for internationally comparable financial statements, leading standard-setting bodies to join efforts over the last four decades to reduce disparity in financial reporting "as a means to facilitate cross-border capital formation while providing *adequate disclosure* for the protection of investors and the promotion of fair, orderly and efficient markets" (SEC, 2007, p. 4, italic added by the author).

At first, efforts were focused on reducing differences between the accounting principles used in major capital markets around the world. Then, international accounting harmonization became an objective of modern accounting (Baker and Barbu, 2007; Barlev and Haddad, 2007), and the title international accounting harmonization has been used to describe a process of reducing accounting differences among countries. In related literature, the concept of harmonization has been defined in many different ways (Taplin, 2011; Cole *et al*., 2009, 2012), and later, in the 1990s, often replaced by the concept of convergence (Ali, 2005, p. 9) when referring to the removal of existing dissimilarities, and the "development of high-quality, *compatible* accounting standards that could be used for both domestic and cross-border financial reporting" (IASB, 2002, italic added by the author).

According to Tay and Parker (1990), harmonization of financial reporting is a process involving movement away from total diversity towards a state of harmony indicated by a concentration of firms around one or a few of the available accounting choices. While harmonization refers to a process, harmony is a state at a given point in time, being that past literature generally uses the term harmony when referring to the comparability of firms' accounts (Taplin, 2011). Both harmonization and harmony may be either *de jure* (formal) or *de facto* (material). The former refers to accounting standards, statutory rules or stock exchange regulations, and the latter relates to the actual practices of firms.

In an attempt to address the problem of international accounting diversities, nine professional accountancy bodies[1] agreed to establish, in 1973, the first international

[1] From Australia, Canada, France, Germany, Japan, Mexico, the Netherlands, the United Kingdom (UK) and Ireland, and the United States of America (US).

standard-setting body (IASC)[2]. Within the European Union (EU), the process of *de jure* (formal) accounting harmonization started with the adoption of the Fourth Directive, in 1978, and had significant development with Regulation (EC) No 1606/2002, requiring publicly traded firms governed by the law of a Member State to prepare their consolidated accounts in conformity with International Financial Reporting Standards (IFRS)[3] for years beginning on or after January 1, 2005.

Although there are several IFRS containing guidelines on the recognition, measurement, and disclosure of financial elements connected to environmental matters, there is not a single standard focused exclusively on environmental issues and their associated effects on firms' accounts. To that extent, financial reporting of environmental issues is largely outside the scope of the formal accounting harmonization within the EU. However, the need to integrate environmental information into financial reporting, in order to enable transparency, is well underlined in the Commission Recommendation of May 2001 (EC, 2001) by stating that "In the absence of harmonised authoritative guidelines in relation to environmental issues and financial reporting, comparability between companies becomes difficult…" (EC, 2001, § 5).

Since Recommendation EC (2001), new issues in the environmental area have emerged. One of them is carbon financial accounting. In 2005, the EU launched the European Emissions Trading System (EU-ETS) as a policy instrument to mitigate global climate change. The scheme is based on the "cap and trade" principle, according to which there is a "cap", or limit, on the total amount of greenhouse gases (GHG)[4] that can be emitted by the installations under the system. Within this cap, firms that operate such installations receive emission allowances (also called emission rights) that can be spent or traded, as needed. The limit on the total number of allowances available ensures that they have a market value, being their price determined by supply and demand. As a

[2] IASC - International Accounting Standards Committee that since 2001 was renamed to IASB - International Accounting Standards Board.

[3] International Financial Reporting Standards are standards issued by the International Accounting Standards Board (IASB). They include the International Accounting Standards and their interpretations adopted by the IASB from its predecessor, the International Accounting Standards Committee (IASC).

[4] The term greenhouse gas (GHG) refers to the following gases covered by the Kyoto Protocol: carbon dioxide (CO2), the major GHG, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons, perfluorocarbons, and chlorofluorocarbons. These GHG are often measured as carbon dioxide equivalents, being that related literature generally uses the expressions "CO2 emissions" and "carbon emissions" interchangeably with "GHG emissions".

result, a new commodity was created in the form of GHG emission allowances, and since carbon dioxide (CO2) is the principal greenhouse gas, this is known as the "carbon market". In 2012, around 8 billion allowances were traded with a total value of € 56 billion, excluding derivatives (EC, 2013).

The purpose of EU-ETS is to generate a price signal, the carbon price, strong enough to drive investment, production and consumption decisions towards a low-carbon economy. Within this policy, carbon financial accounting and reporting could be an important tool to reduce emissions by clearly releasing costs of carbon to stakeholders so that they could incorporate this information in strategic decision-making. However, EU-15 firms under IFRS have no mandatory guidance on how to report emission allowances in their annual accounts. The only exception is Spain, where national accounting dispositions on emission allowances are compulsory to entities operating installations linked to the Spanish allowances allocation plan, regardless if they draw up their financial statements under national GAAP or under IFRS.

Due to the lack of specific guidance, divergent accounting practices have emerged, and their implications may be significant not only for the financial position and performance reported in the annual accounts, but also on how a firm may decide to manage emission allowances (PwC and IETA, 2007; Lovell *et al*., 2010; Black, 2013; Haupt and Ismer, 2013; Giner, 2014). In view of this, disclosure provided in the explanatory notes would be of major importance for users to evaluate firms' performance in terms of GHG emissions. According to Lovell and Mackenzie (2011, p. 727) some firms under EU-ETS have advocated a readiness for clear guidance from standard-setting bodies "so that companies can be fairly compared with their competitors, creating a level playing field".

Prior literature on international accounting harmonization (Meek and Saudagaran, 1990; Ali, 2005; Baker and Barbu, 2007) suggests that, in general, *de facto* (material) harmony may arise from two different forces: institutional endeavors to harmonize international financial reporting standards; and, voluntary movements by firms towards similar accounting practices, independently from the harmonization of accounting regulations.

The harmonization of practices through the harmonization of accounting regulations is

one purpose of accounting standard-setting bodies. When this goal is achieved *de jure* (formal) harmonization leads to *de facto* (material) harmonization. But the existence of formal harmonization does not assure, by itself, the comparability of accounting information (van der Tas, 1992b; Emenyonu and Gray, 1992; Emenyonu, 1993; Cairns, 1997; Emenyonu and Adhikari, 1998; Nobes, 1998; Ali and Hwang, 2000; Ball *et al*., 2000; Ball *et al*., 2003; Barbu *et al*., 2014). Even when compliance with regulations is legally required, firms may not comply if it is perceived that the consequences of non-compliance are not serious (Tay and Parker, 1990; Oliver, 1991).

On the other hand, the diversity or the lack of accounting standards does not necessarily imply the diversity of practices. Some research (van der Tas, 1988; Tay and Parker, 1990; Aisbitt, 2001) suggests that convergence may occur by a process of voluntary or spontaneous harmonization when most firms consider that it is of their convenience. In particular, the globalization of capital markets and the internationalization of firms' operations are singled out in related literature as factors that may lead to voluntary harmonization (Thorell and Whittington, 1994; Cañibano and Mora, 2000; Jaafar and McLeay, 2007).

Concurrently, some strands of international accounting research suggest that national accounting standards, in spite of no longer applying to the consolidated statements of EU listed firms since 2005, may explain some continued dissimilarities in their reporting practices (Nobes, 2006, 2008; Kvaal and Nobes, 2010), namely on the level of environmental disclosure (Barbu *et al*., 2014). However, most of prior multi-country studies examining disclosure practices of EU firms applying IFRS do not consider discrepancies in national accounting guidance. Moreover, as regards harmonization studies, while numerous research has been conducted on the harmonization of measurement practices, investigation concerned with the harmonization of disclosure is scarce (Emenyonu and Gray, 1996; Ali, 2006).

Against this background, this study fills a gap in literature in two different ways: primarily, by linking international accounting harmonization with environmental disclosure; additionally, taking into consideration the existing accounting guidance, in firms' home-country, mandatory, or not, for entities under IFRS. The aim is twofold:

(i) To provide evidence whether guidance on accounting for GHG emission allowances, issued in firms' home-country, enhances the harmony in, as well as, the level of *disclosure on GHG emission allowances in the annual accounts* (hereafter, carbon financial disclosure). If so, a "disciplinarian effect" of accounting standards over carbon financial disclosure would have occurred.

(ii) To investigate whether the internationalization of firms, through the capital markets or through foreign sales, is likely to improve, by itself, the harmony in, as well as, the level of carbon financial disclosure. If so, a "disciplinarian effect" of markets over carbon financial disclosure would have occurred.

Acknowledging that, in general, high harmony levels are more likely to take place when there is low release of information (Rahman *et al*., 2002), this study examines both the level of disclosure and the level of harmony (in disclosure), in order to fully evaluate a possible "disciplinarian effect" of standards and markets on the dissemination of further and more comparable information on GHG emission allowances in the annual accounts.

Overall, the purpose of this investigation is to shed light on areas where previous research showed mixed results (the relationships between firms' internationalization and disclosure) or is scarce (disclosure practices under mandatory guidance), and simultaneously contribute to the ongoing debate on mandatory versus voluntary disclosures on GHG emissions (Simnett and Nugent, 2007; Simnett *et al*., 2009; Cowan and Deegan, 2011; Choi *et al*., 2013).

Additionally, regulatory influences coming from industry affiliation are also examined. At EU level, high carbon intensive firms are subject to further sector-level regulations on their emissions. Therefore, due to more scrutiny and institutional pressure, they are more likely to have created routines to collect, treat and release information on GHG emission allowances, than less pollutant activities (Stanny and Eli, 2008; Stanny 2013). On the other hand, harmony is likely to occur at industry level, since sector-level institutions play a key role in the diffusion of minimum standards for corporate social responsibility (Jackson and Apostolakou, 2010). Bearing this in mind, this study tests industry effects over the harmony in, and the level of carbon financial disclosure.

In order to accomplish the study objectives a sample of 168 EU-15 listed firms covered

by EU-ETS was considered over an eight-year period (2005-2012), amounting to 1 344 firm-year observations. The selection of the beginning period has been due to the start of the first trading period of EU-ETS in 2005.

The research is organized into seven chapters, including this introduction. Next, Chapter 2 refers the regulatory background, describing the European scheme for the trading of GHG emission allowances, and the accounting framework for EU-15 listed firms covered by the system. The analysis comprehends an overview, at EU-15 level and by Member State, of accounting regulations on GHG emission allowances. In particular, it addresses dissimilarities in existing guidance as for the clarity and detail of the items to be reported in the explanatory notes to the annual accounts. Prior literature on mandatory disclosure remarks that simply creating further reporting regulations will not necessarily lead to real change in disclosure, unless such dispositions are clearly delineated to reduce management discretion (Criado-Jiménez *et al*., 2008; Peters and Romi, 2013). Expanding prior research, this study examines if the same applies to guidance that it is not mandatory.

Chapter 3 presents a review of literature concerning the concept and the measurement of harmonization of financial reporting, addressing in particular the operationalization of the concept of *de facto* (material) accounting harmony. Following related literature, the T index, introduced by Taplin (2004), is employed to measure *de facto* (material) disclosure harmony in the present research. The T index seems to be the most appropriate method as it brings together all of the required properties to quantify harmony of firms' accounts (Cole *et al*., 2009; Mustata *et al*., 2011). The T index equals the probability that two firms randomly selected, with replacement, have accounts that are comparable (ranging from 0, when all firms have financial statements non-comparable to each other, to 1, when all firms have financial statements that are comparable to each other). Changes in index values over time would indicate that harmony is increasing (decreasing), suggesting, therefore, that harmonization (disharmonization) occurred.

Chapter 4 presents theoretical and empirical frameworks to examine harmony of firms' accounts under mandatory guidance or due to voluntary processes, and to identify the drivers of both mandatory and voluntary environmental disclosure. Consistent with

prior investigation on environmental disclosure (Deegan, 2002; Cormier *et al*., 2005; Chen and Roberts, 2010), a multi-theoretical framework is adopted to address research questions, assuming that corporate disclosure is an outcome of management's assessment of economic incentives, public pressures, and institutional constraints. It is beyond the scope of this study to fully investigate patterns of disclosure across different types of national institutional environments. However, considering that macro-level factors (e.g., culture, form of equity market, sociopolitical environment), are likely to affect the ways in which firms communicate with stakeholders (Midttun *et al*., 2006; Freedman and Jaggi, 2005, 2011; Carnevale *et al*., 2012; Faisal *et al*., 2012), variables capturing the institutional environment in firms' home-country are also incorporated in the analysis when examining levels of carbon financial disclosure among EU-15 firms.

Chapter 5 provides empirical evidence on the effects of regulatory background, affiliation in high carbon intensive industries, and international exposure, over the level of carbon financial disclosure. For the purpose of measuring firms' level of disclosure, a disclosure index (dichotomous, unweighted, and adjusted for non-applicable items) is constructed. Following related literature, a set of multilevel (hierarchical) models are estimated to examine the effects of firm-level and country-level explanatory variables on carbon financial disclosure, and to test if the explanatory variables at the country-level (type of guidance) serve as moderators of the firm-level relationships between internationalization and disclosure.

Chapter 6 provides empirical evidence aiming at evaluate whether accounting guidance or the internationalization of firms lead to increased harmony in carbon financial disclosure. For the purpose of measuring harmony (comparability) of firms' accounts, T indices (Taplin, 2004) are computed for different groups of firms (sorted according the relevant criteria to test research questions), as well as for the whole sample to evaluate harmony in carbon financial disclosure at EU-15 level. In all cases, to assure that the harmonization towards a more informative policy gets a higher score, different levels of comparability are allocated to different disclosure methods in accordance with the extent of information provided by each method.

Chapter 7 provides a summary of the main research findings and their implications, major contributions and limitations of the study, and suggestions for further research.

Altogether, findings allow not reject that accounting guidance on GHG emission allowances, even not mandatory for firms under IFRS, exerts a "disciplinarian effect" over carbon financial disclosure, by significantly increasing the harmony in, as well as, the level of disclosure on GHG emission allowances in the annual accounts. As anticipated, the highest levels of harmony and disclosure are associated with the scenario of mandatory guidance followed by the case of not mandatory guidance that details the items to be reported in the annex. In the opposite pole lies the scenario of no guidance where levels of harmony and levels of disclosure are minimal.

Additionally, a more in-depth analysis reveals that, although not ensuring full compliance, mandatory guidance seems to exert the major "disciplinarian effect" on the dissemination of quantitative items, precisely the kind of disclosure that firms are less willing to reveal as it conveys more proprietary information (Cho and Patten, 2007; Cormier *et al*., 2009). These outcomes are important for regulatory bodies aimed at enhance utility and relevance of financial statements. It is essential that firms provide quantitative (monetary and non-monetary) disclosure on their efforts and achievements in reducing GHG emissions, namely to assist investors in assessing the trade-off between risk and return (Freedman and Jaggi, 2005, 2011), to provide the information that users need to project future cash flows (EFRAG, 2012), and to evaluate firms' environmental and financial performances. To this end, evidence suggests that mandatory guidance is needed because, otherwise, the level of carbon financial disclosure, especially on quantitative items, is predicted to be significantly lower.

As regards the influence of regulatory background at country level, this study indicates that disclosure practices of firms applying IFRS are likely to be affected by domestic guidance on GHG emission allowances not intended for them. Actually, national guidance is the most significant predictor in explaining variance between countries, at EU-15 level. Largely, findings suggest that national guidance, even not mandatory for firms under IFRS, is able to interfere with the process of *de facto* (material) accounting harmonization among EU-15 firms applying IFRS.

Also, as expected, outcomes confirm the prediction that higher levels of disclosure and harmony are more likely to occur in high carbon intensive industries, than in low carbon intensive industries. In fact, among all the firm-level predictors, industry affiliation is

the one that added the major contribution in explaining within countries variance, and exhibits the strongest association with the level of carbon financial disclosure. Moreover, results point out that harmony is likely to occur at industry level, since levels of harmony are significantly higher within industries, than between industries.

Otherwise, results do not confirm the assumption that firms' internationalization, through the capital markets or through foreign sales, is likely to put forth, by itself, a "disciplinarian effect" over carbon financial disclosure.

With regard to the internationalization through the capital markets, it should be noted that almost all foreign listed firms in the sample are registered in US stock exchanges. Consequently, for EU-15 firms (domiciled in countries that ratified the Kyoto Protocol) the internationalization through the quotation in US stock exchanges (a country that has not ratified the Protocol) does not seem to exert further pressure (in addition to the existing in firms' home-country) to enhance carbon financial disclosure. In the lens of stakeholder theory and institutional theory, results suggest that, as foreign listed firms realize that this particular information is not broadly valued by their foreign stakeholders, to be accountable in front of a wider stakeholders audience is not enough to motivate, by itself, a "disciplinarian effect" over carbon financial disclosure. So, when considering either the harmony in or the level of carbon financial disclosure, results indicate that, *ceteris paribus*, EU-15 firms listed abroad are not likely to perform significantly different than EU-15 firms listed only in domestic stock exchanges.

As regards the internationalization through foreign sales, findings allow admitting that, ultimately, the improvement on the level of carbon financial disclosure among EU-15 firms operating internationally is triggered by guidance in home-country. Extending the hypotheses advanced by Oliver (1991) to an international environment, the lack of international consensus regarding either the commitment to the Kyoto Protocol, or the appropriate accounting model for emissions trading schemes, do not favor a process of voluntary release of costs of carbon by EU-15 multinational firms. In particular, due to multiplicity and fragmentation of foreign stakeholders (lack of broadly diffused, or widely validated, values, norms and practices on emissions trading schemes), EU-15 firms operating globally tend to respond primarily to domestic institutional pressures, from which organizational dependencies are deemed to be higher.

Accordingly, evidence suggests that disclosure strategies of EU-15 firms exposed to foreign markets are primarily driven by guidance in home-country. That is, under not mandatory detailed guidance the improvement on the level of disclosure is likely to occur by means of more qualitative information, while the release of quantitative data is more likely to occur under mandatory guidance. In turn, when there is no specific guidance in the firm's home-country or when existing guidance does not specify the items to be disclosed, firms' skepticism about the strategic utility of carbon financial disclosure as a tool to manage a multiplicity of foreign stakeholders seems to inhibit further improvements on the level of disclosure among EU-15 firms with higher exposure to foreign markets. Hence, all else equal, the levels of disclosure among them are not significantly different from those of EU-15 firms operating mainly in domestic markets. Moreover, as regards the harmony in carbon financial disclosure, results indicate that, under no mandatory regime, differences between firms with higher and lower exposure to foreign markets are not statistically significant.

Overall, when evaluating harmony in, and level of carbon financial disclosure among EU-15 firms, although some progresses were registered along the research period, we arrive at 2012 with 38% of sample firms not disclosing any information in their annual accounts. In particular, with regard to the harmony at EU-15 level, the probability that two firms randomly selected have accounts that are comparable ranges from, 3,5%, in 2005, to 5,6%, in 2012. Currently, both firms and regulators are more conscientious of the urgent need for mandatory guidance in order to enable comparability of carbon financial disclosure (Lovell and McKenzie, 2011; ANC, 2012; EFRAG, 2012; Giner, 2014). Findings confirm this view, by suggesting that we cannot rely on a possible "disciplinarian effect" of markets to induce EU-15 firms to disclose further or more comparable information on GHG emission allowances in the annual accounts.

Finally, it should be noted that, despite being consistent with theories based upon the concept of organizational legitimacy, the above mentioned results must be taken with restraint. The number of countries used for this analysis is limited to EU-15 Member States, and even within these countries the study covers just a sample of firms under EU-ETS. Hence, any attempt to generalize or extrapolate the findings of this study outside this context should be made with caution.

2. Overview of regulatory background

This chapter describes the European scheme for the trading of greenhouse gas emission allowances, and the accounting framework for EU-15 listed firms covered by the system.

2.1. The Kyoto Protocol

In 1992, countries participating at Rio Conference organized by the United Nations agreed to cooperate in order to stabilize greenhouse gas (GHG) concentrations (largely carbon dioxide) "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system" (UNFCCC, 1992, p. 4). The ultimate goal was that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner" (UNFCCC, 1992, p. 4). Subsequent negotiations lead to the signature of the Kyoto Protocol in 1997, entering into force only in 2005 after a complex ratification process[1].

According to the principle of "common but differentiated responsibility", the Kyoto Protocol places a heavier burden on developed countries to reduce GHG emissions. The underlying notion is that industrialized countries are largely responsible for the current high levels of GHG emissions in the atmosphere, which are the result of more than a century and a half of industrial activity. In fact, most of the world's emissions come from a relative small number of countries. The seven largest emitters (US, EU, China, Russia, Japan, India, and Canada) accounted for more than 70% of energy-related CO2 emissions, in 2004. In particular, the US was responsible for 20% of global emissions, being the largest emitter in absolute terms and, on a per capita basis, US emissions were roughly twice as high as those of EU or Japan and five times the world average (Pew Center on Global Climate Change, 2009, pp. 1-2). Interestingly, among the countries that signed the Kyoto Protocol in 1997, only the US has not ratified it[2]. In turn, Canada (a country that has signed the agreement in 1997 and ratified it in Parliament in 2002) decided to withdraw in 2012.

[1] Information available at the web site of the United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int/essential_background/items/6031.php. Last accessed on 19 July 2014.
[2] US agreed with Kyoto Protocol in principle but the US Congress has not ratified it.

Under the Kyoto Protocol, three market-based mechanisms were created as means for participants comply with their targets (besides adopting other climate policy measures at domestic level): (i) Clean Development Mechanism; (ii) Joint Implementation Mechanism; and (iii) International Emissions Trading. In this regard, a distinction is made between the so-called Annex I countries (industrialized countries) and non-Annex I countries (developing countries). Each Annex I country is obliged to reach a domestic target to mitigate climate change, while non-Annex I countries do not have emission reduction targets but must ratify the Protocol in order to be hosting emission reduction projects under the Clean Development Mechanism.

The Clean Development Mechanism, defined in Article 12th of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex I country) to implement an emission-reduction project (for instance, a rural electrification project using solar panels or the installation of more energy-efficient boilers) in developing countries with no emission reduction targets (non-Annex I countries). Such projects can earn saleable certified emission reduction (CER) credits which can be counted towards meeting Kyoto targets.

On the other hand, the Joint Implementation Mechanism, defined in Article 6th of the Kyoto Protocol, allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex I country) to earn saleable emission reduction units (ERU) from an emission-reduction or emission removal project in another Annex I country, which can be counted towards meeting its Kyoto target.

Finally, the International Emissions Trading, set out in Article 17th of the Kyoto Protocol, allows Annex B countries (Annex I countries, except Turkey and Belarus) that have accepted targets for limiting or reducing emissions (expressed as levels of allowed emissions) to sell any excess capacity (emissions permitted to them but not used) to countries that are over their targets. Emissions trading schemes (ETS) may be established at the national level or the regional level. Under such schemes, authorities set emissions obligations to be reached by the participating entities.

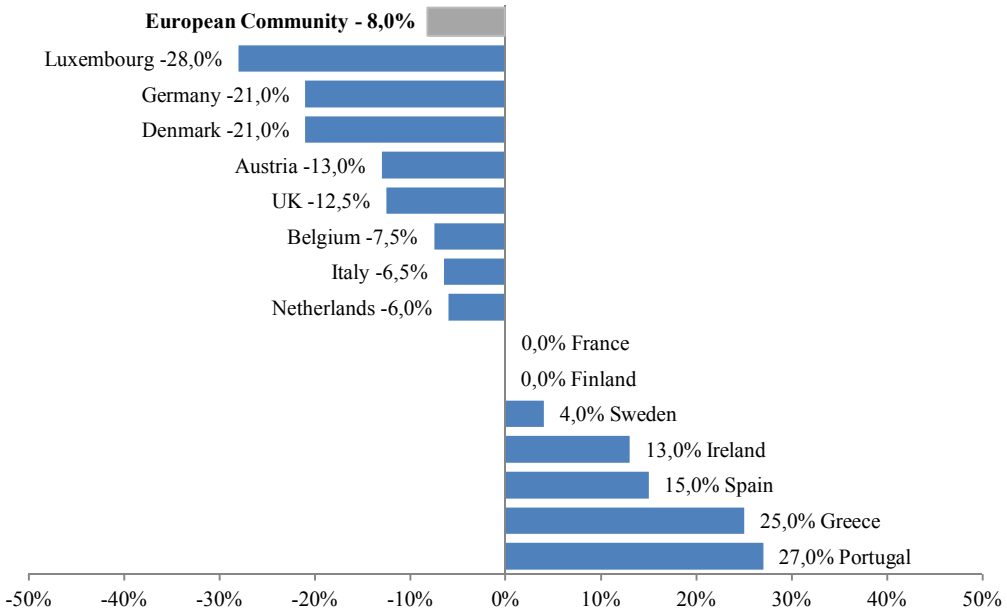
The largest system in operation is the European Union emissions trading scheme, (described in the next section), being that, over the research period (from 2005 to 2012),

regional initiatives were scarce[3] and at, national level, only three emissions trading schemes were initiated outside the EU - New Zealand ETS (2008), Swiss Federal ETS (2008), and Japan Voluntary ETS (2009) -, the later working on a voluntary basis[4].

2.2. The European Emissions Trading System

In 2000, the EU Commission created the European Climate Change Program[5] to help identify the most environmentally-effective and most cost-effective strategies that could be taken at the EU level to cut GHG emissions. The immediate goal was to help ensure that the EU would meet its target for reducing emissions under the Kyoto Protocol. This commitment required the countries that were EU members before 2004 (EU-15) to cut their combined emissions of greenhouse gases to 8% below the 1990 level, by 2012[6].

Figure 2-1: Emissions limitation or reduction commitments by 2012 in accordance with Article 4th of the Kyoto Protocol (% of base year 1990)



Source: OJ L 130, 15.5.2002, p.19.

[3] New South Wales GHG Abatement Scheme (2003), Alberta ETS (2007), US Northeast and Mid-Atlantic States Regional GHG Initiative (2009), HB 7135 Florida (2010).

[4] Additionally, the CRC Energy Efficiency Scheme was initiated in UK, in 2010, covering only large non-energy intensive organizations that fall below EU-ETS thresholds. Information available at the web site of the International Emissions Trading Association (IETA), http://www.ieta.org/worldscarbonmarkets. Last accessed on 19 July 2014.

[5] http://ec.europa.eu/clima/policies/eccp/first/index_en.htm. Last accessed on 19 July 2014.

[6] The EU-28 does not have a common target under the Kyoto Protocol in the same way as the EU-15. Of the 13 countries which have joined the EU since the Kyoto Protocol was agreed, all except Cyprus and Malta have individual emission reduction commitments under the Protocol.

The 8% collective reduction commitment has been translated into national emission limitation targets for each one of the EU-15 Member States under what is known as the "burden sharing" agreement. These national targets, compulsory under the EU law[7], are differentiated according to each Member State's relative wealth at that time, and range from an emissions reduction of 28%, for Luxembourg, to an increase of 27%, for Portugal, as shown in figure 2-1.

In order to achieve those targets, the EU launched, in 2005, the European Emissions Trading System (EU-ETS)[8]. It is the first and biggest international scheme for the trading of GHG emission allowances[9] (also called emission rights or licenses because one allowance gives the right to emit one tone of GHG). It covers CO2 emissions from installations, above certain levels of ability, such as power stations, combustion plants, oil refineries and iron and steel works, as well as factories making cement, glass, lime, bricks, ceramics, pulp, paper and board. Since the beginning of 2012, aviation activities were also included, and in 2013 the scheme was further expanded to the petrochemicals, ammonia, and aluminum industries, as well as to additional GHG.

The EU-ETS established by Directive 2003/87/EC (EU-ETS Directive)[10] is based on the "cap and trade" principle. According to this principle, there is a "cap", or limit, on the total amount of GHG that can be emitted by the installations under the system. Within this cap, firms that operate such installations receive emission allowances that can be spent or traded, as needed. The limit on the total number of allowances available ensures that they have a value.

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[7] Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfillment of commitments thereunder, 15.5.2002, OJ L 130, pp. 1-20.

[8] http://ec.europa.eu/clima/policies/ets/index_en.htm. Last accessed on 19 July 2014.

[9] Currently, it comprises nearly 12000 industrial plants in 31 countries: the 28 EU Member States plus Iceland, Liechtenstein and Norway.

[10] Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, 13.10.2003, OJ L 275, pp.32-46. Amended by Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms, 13.11.2004, OJ L 338, pp.18-23; Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, 13.1.2009, OJ L 8, pp.3-21; and Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the community, 5.6.2009,OJ L 140, pp.63-87.

Since 2005, the EU-ETS worked for two trading periods (2005-2007 | 2008-2012). Before the start of each trading period, each Member State should submit to the EU Commission a National Allocation Plan (NAP) setting out how many allowances were being allocated for the next period and how many allowances would receive each installation covered by the scheme. The assessment of the NAP was made by the EU Commission in order to assure that the allowances were in line with the Kyoto Protocol. For the third trading period (2013-2020), there will no longer be any NAP. Instead, the allocation is determined directly at the EU level.

According to the Article 14th of the EU-ETS Directive, the EU Commission has adopted guidelines for the monitoring and reporting of GHG emissions under EU-ETS[11]. After the end of each calendar year, each firm has to report its actual emissions from that year, assure independent verification of this report, and submit it to the competent national authority by 31 March. By 30 April, the firm has to surrender a number of allowances equivalent to its verified emissions in the previous year. When actual emissions are lower than allowances held, a firm can keep the spare licenses to cover its future needs (within the same trading period) or sell them to another firm. Otherwise, when firms return an insufficient number of allowances to cover their emissions they have to pay a financial penalty for each missing allowance to the corresponding Member State[12], being that the payment of the excess emissions penalty does not release the operator from the obligation to surrender an amount of allowances equal to those excess emissions when surrendering allowances in relation to the following calendar year. Annual compliance cycle is closed by the cancellation of surrendered allowances by 30 June.

The information collected by firms to respond to the requirements of the GHG emission monitoring and reporting process (e.g., tones of GHG emissions made during the year, shortfall or surplus of allowances at year-end), along with other disclosure (namely monetary data showing the effects on financial position and performance), would be useful for users of financial statements be aware of the risks, and the associated mitigation efforts, that GHG emissions pose to firms.

[11] http://ec.europa.eu/clima/policies/ets/monitoring/index_en.htm. Last accessed on 19 July 2014.
[12] The financial penalties were established at € 40 and € 100, for the first and second trading periods, respectively.

The need to integrate environmental matters into financial reporting as a key factor that enables transparency of information was well underlined in the Commission Recommendation of May 2001 (EC, 2001)[13] by stating that "In the absence of harmonised authoritative guidelines in relation to environmental issues and financial reporting, comparability between companies becomes difficult…" (EC, 2001, § 5).

In particular, evidence suggests that, under no specific accounting guidance on how to report GHG emission allowances, firms are likely to provide very limited disclosure in their annual reports (Haque and Deegan, 2010). In view of this, accountants at major firms under EU-ETS have suggested a readiness for clear guidance from standard-setting bodies "so that companies can be fairly compared with their competitors, creating a level playing field" (Lovell and Mackenzie, 2011, p.727).

Next section describes the accounting framework for EU-15 listed firms covered by the system. The analysis comprehends an overview, at EU-15 level and by Member State, of accounting regulations on GHG emission allowances. Other explanatory factors influencing the level of disclosure and the harmony of firms' accounts are discussed in chapter 4.

2.3. Accounting guidance on GHG emission allowances

Preliminary remark

The comprehensive accounting for GHG emissions goes beyond the scope of the financial reporting accounting standards. It involves also the establishment of internationally accepted rules for quantifying the GHG released to the atmosphere by activities producing emissions. Both issues belong to a wider research field known as "carbon accounting" (Guenther and Stechemesser, 2011; Milne and Grubnic, 2011). *The last area is outside of the aim of the present investigation.*

2.3.1. Overview at the EU-15 level

At the EU level, the process of *de jure* (formal) accounting harmonization started with

[13] Commission Recommendation of 30 May 2001 on the recognition, measurement and disclosure of environmental issues in the annual accounts and annual reports of companies, 13.6.2001, OJ L 156, pp. 33-42.

the adoption of the Fourth Council Directive[14] of July 25, 1978, and had significant development with Regulation (EC) No 1606/2002 of July 19, 2002[15], requiring publicly traded firms governed by the law of a Member State to prepare their consolidated accounts in conformity with IFRS for years beginning on or after January 1, 2005[16].

Although there are several IFRS containing guidelines on the recognition, measurement, and disclosure of environmental matters, the IASB has not delivered a standard focused exclusively on environmental issues and their associated effects in the annual accounts. To that extent, environmental financial reporting is largely outside the scope of the formal accounting convergence process within the EU.

It should be noted that the absence of harmonized authoritative guidelines on environmental reporting had already motivated the Recommendation EC (2001) concerning both the recognition, valuation and reporting of environmental issues in the annual accounts, and the provision of environmental information in firms' annual reports.

The dispositions relating to the environmental information to be provided in the corporate management report were later incorporated in Directive 2003/51/EC (Modernisation Directive)[17], and subsequently transposed into the national legal systems of the various Member States. The Modernisation Directive enhanced requirements for the annual report to include non-financial information related to environmental and employee matters, when relevant for an understanding of the firm's

[14] Fourth Council Directive 78/660 of 25 July 1978 on the annual accounts of certain types of companies, 14.8.1978, OJ L 222, pp.11-31. This Fourth Company Law Directive coordinates Member States' provisions concerning the presentation and content of annual accounts and annual reports, the valuation methods used and their publication in respect of all companies with limited liability. Together with the Seventh Council Directive that coordinates national laws on consolidated accounts, it belongs to the family of accounting directives that form the arsenal of EU legal acts governing company accounts.

[15] Regulation (EC) No 1606/2002 of the European Parliament and of the Council of 19 July 2002 on the application of international accounting standards, 11.9.2002, OJ L 243, pp.1-4.

[16] Member States have the option to extend this requirement to unlisted companies and to individual financial statements. On the other hand, companies traded both in the EU and on a regulated market outside the EU that were already applying another set of internationally accepted standards (for example, US Generally Accepted Accounting Principles (GAAP)), and companies that had issued debt instruments but not equity instruments could be temporarily exempted by the Member States and not required to comply with IFRS until January 1, 2007.

[17] Directive 2003/51/EC of the European Parliament and of the Council of 18 June 2003 amending Directives 78/660/EEC, 83/349/EEC, 86/635/EEC and 91/674/EEC on the annual and consolidated accounts of certain types of companies, banks and other financial institutions and insurance undertakings, 17.7.2003, OJ L 178, pp. 16-22.

development, performance or financial position. These requirements came into effect on January 1, 2005 in all EU Member States[18].

With regard to the recognition, valuation and reporting on environmental issues in the annual accounts, although some countries (e.g., Belgium, Finland, France, Portugal, and Spain) have issued national accounting standards to promote the implementation of the Recommendation EC (2001), generally such dispositions do not apply to entities under IFRS and so, for them, most of the provisions of this Recommendation remains as voluntary guidelines.

There are no major conflicts between the Recommendation EC (2001) and similar IFRS. Most subjects detailed there are covered by IAS 16 *Property, Plant and Equipment* (IAS 16), IAS 20 *Accounting for Government Grants and Disclosure of Government Assistance* (IAS 20), IAS 36 *Impairment of Assets* (IAS 36), IAS 37 *Provisions, Contingent Liabilities and Contingent Assets* (IAS 37), and IAS 38 *Intangible Assets* (IAS 38), and in that extent they already apply for listed firms pursuant to Regulation (EC) No 1606/2002. However, in IFRS the environment is not emphasized as a distinct area and evidence suggests that these lack of specific rules for the recognition, measurement and disclosure of environmental matters undermines the transparency and the comparability of firms' accounts (Lovell *et al*., 2010; ANC, 2012; EFRAG, 2012; Black, 2013; Haupt and Ismer, 2013; Barbu *et al*., 2014; Giner, 2014).

Since the issuance of Recommendation EC (2001), new topics in the environmental area have emerged. One of them is the accounting of GHG emission allowances. In this regard, the IASB's International Financial Reporting Interpretations Committee (IFRIC) developed an interpretation (IFRIC 3 *Emission rights*) to explain how to apply existing IFRS to "cap and trade" schemes. It was concluded in December 2004, to be ready for the launch of the EU-ETS in January 2005.

Next Table summarizes main guidelines, being that IFRIC 3 only covers recognition and measurement criteria. As regards disclosure, it concludes that no requirements were

[18] The Modernisation Directive applies to all large and medium sized European entities regardless of whether they are listed or not. However, Member States may choose to exempt medium-sized entities from the obligation to make certain non-financial disclosures. This option was not taken up by Lithuania, Portugal and Spain.

needed beyond those already contained in the existing standards (IFRIC 3, Basis for Conclusions, §§ 35-36).

Table 2-1: Guidance provided by IFRIC 3 *Emission rights* withdrawn June 2005

IFRIC 3 main guidelines
√ A "cap and trade" scheme **GIVES RISE TO**:
- An asset for allowances held, whether issued by government or purchased. Allowances (rights to emit pollutant) are intangible assets that should be recognized in the financial statements in accordance with IAS 38. When allowances are issued to a participant by government, or government agency, for less than their fair value, the difference between the amount paid, if any, and their fair value is a government grant that is accounted for in accordance with IAS 20.
- A liability for the obligation to deliver allowances. As a participant produces emissions, it recognizes a provision for its obligation to deliver allowances equal to emission that have been made, in accordance with IAS 37. This provision is measured at the market price of the number of allowances required to cover emissions made up to the balance sheet date.
√ A "cap and trade" scheme **DOES NOT GIVE RISE TO** a net asset or liability.

Source: IFRIC 3 *Emission rights* (IASB, 2004)

The consensus in IFRIC 3 is that a "cap and trade" scheme gives rise to an asset for allowances held, a government grant for allowances issued for less than their fair value, and a liability for the obligation to deliver allowances measured at market price at balance sheet date. Moreover, the Interpretation remarks that a "cap and trade" scheme does not give rise to a net asset or liability, ruling out the possibility of offsetting (netting off) assets (that is, allowances held) and liabilities (that is, the obligation to deliver allowances), and prevents participants from using the option in IAS 20 that would allow them to recognize free allocations at a nominal amount of nil value.

As part of the EU endorsement process, the European Financial Reporting Advisory Group (EFRAG) provided an opinion on the adoption of IFRIC 3 within EU. According to the EFRAG, IFRIC 3 did not meet all the requirements established in the Regulation (EC) No 1606/2002[19] and, therefore, EFRAG recommended that the EU Commission should not endorse IFRIC 3.

[19] EU publicly traded companies will be required to comply with only those IFRS that have been endorsed by the European Commission (EC). IFRS can only be endorsed if they: (1) are not contrary to EU Accounting Directives and the true and fair view principle; (2) are conducive to the European public good; and (3) meet the criteria of understandability, relevance, reliability, and comparability (Regulation (EC) No 1606/2002, Article 3(2)).

Although considering IFRIC 3 an appropriate interpretation of the existing standards (IAS 20, IAS 37, IAS 38), both the IFRIC and the IASB acknowledged that IFRIC 3 created unsatisfactory measurement and reporting contradictions:

(i) Under the IFRIC 3 cost model, the allowances would be measured at cost (following IAS 38 cost model), while the liability would be measured at current value (in accordance with IAS 37).
(ii) Under the IFRIC 3 revaluation model, the carrying amount of the allowances and the liability would match, but the changes in the value of the allowances would be recognized in equity (IAS 38), while the re-measurement of the liability would be recognized in the income statement (IAS 37).

Faced with these inconsistencies, the IASB withdrew IFRIC 3 with immediate effect at its meeting in June 2005, and in September 2005 added to its agenda a project to generate a comprehensive model for emissions trading schemes. However, since then, the IASB has postponed consecutively the review of emission rights' accounting.

Currently, there is in effect no IFRIC or specific IFRS for the accounting of emission rights and due to the lack of specific guidelines divergent accounting practices have emerged whose effects on the financial statements are potentially material (EFRAG, 2012, § 5). Previous studies examining existing accounting practices (PwC and IETA, 2007; Warwick and Ng, 2012; Black, 2013; Haupt and Ismer, 2013) identified a number of accounting treatments that, despite their variety, can be grouped into three main variants:

- The IFRIC 3 approach.
- The "cost of settlement approach".
- The "net liability approach".

Table 2-2 summarizes the recognition and measurement criteria according these three accounting models.

Table 2-2: The main accounting practices for the recognition and measurement of GHG emission allowances after the withdrawal of IFRIC 3

	Full market value approach IFRIC 3	Remainder value approaches	
		Gross liability approach CoS – GLA (CoS)	Net liability approach CoS – NLA (NLA)
Allowances			
Recognition	As intangible assets, when able to exercise control.	As intangible assets, when able to exercise control.	As intangible assets, when able to exercise control.
Initial measurement	Granted allowances: at fair value at grant date. Purchased allowances: at cost.	Granted allowances: at fair value at grant date. Purchased allowances: at cost.	Granted allowances: at a nominal amount of nil value. Purchased allowances: at cost.
Subsequent measurement	At cost or at revalued amount, subject to review for impairment.	At cost or at revalued amount, subject to review for impairment.	At nil (granted) | At cost subject to review for impairment (purchased).
Government grant			
Recognition	As deferred income, at grant date when allowances are issued for less than their fair value.	As deferred income, at grant date when allowances are issued for less than their fair value.	Not applicable.
Initial measurement	At the difference between the fair value of the allowances granted and the amount paid for them if any.	At the difference between the fair value of the allowances granted and the amount paid for them if any.	Not applicable.
Subsequent measurement	Amortized on a systematic and rational basis over the compliance period.	Amortized on a systematic and rational basis over the compliance period.	Not applicable.
Liability			
Recognition	When incurred, as emissions are made.	When incurred, as emissions are made.	When incurred, as emissions are made, being that liability becomes greater than zero only when actual emissions exceed free allocations.
Initial measurement	Fully based on the market price of allowances, whether the allowances are in hand or have to be purchased from the market.	For allowances held: at carrying amount (cost or revalued amount, less impairment) on either a FIFO or weighted average cost basis. For any excess of emissions: at market price of allowances.	For allowances held: at carrying amount (nil value or cost less impairment) on either a FIFO or weighted average cost basis. For any excess of emissions: at market price of allowances.
Subsequent measurement	Re-measurement until the settlement of the obligation at the market price of allowances at each period end, whether the allowances are in hand or have to be purchased from the market.	Re-measurement until the settlement of the obligation. For allowances held: at carrying amount (cost or revalued amount, less impairment) on either a FIFO or weighted average cost basis. For any excess of emissions: at the market price of allowances at period end.	Re-measurement until the settlement of the obligation. For allowances held: at carrying amount (nil value or cost less impairment) on either a FIFO or weighted average cost basis. For any excess of emissions: at the market price of allowances at period end.

Source: Adapted from PwC and IETA (2007, p. 27) | Note: Allowances held-for-trading are not under consideration.

Under the IFRIC 3 approach, the full obligation to surrender allowances is recognized at fair value at balance sheet date (full market value approach). However, following the withdrawal of IFRIC 3, firms often apply a different measurement criterion in which the portion of the liability covered by the licenses held is measured at the carrying amount of those licenses and only the shortfall of allowances is measured at fair value at the period end. This procedure is known as "remainder value approach" because only missing allowances are valued at fair value at balance sheet date, or "cost of settlement approach'' (hereafter named as CoS) because the amount of liability can be considered as representing the cost to solve the obligation to deliver allowances. Within this method, a common policy choice consists in measuring allowances granted free of charge at a nominal amount of nil value (IAS 20, § 23). In this case, a liability is recognized only when actual emissions exceed free allocations, arriving at a model generally known as "net liability approach" (hereafter named as NLA).

The overall effects on the annual accounts, for a participant in an emissions trading scheme, other than a broker or other position-taking institution, are illustrated in Table 2-3 (positions before settlement) and Table 2-4 (positions after settlement), according to the main accounting approaches identified earlier (PwC and IETA, 2007; Warwick and Ng, 2012; Black, 2013; Haupt and Ismer, 2013) for GHG emission allowances:

(1) IFRIC 3 cost model (IFRIC 3).
(2) IFRIC 3 revaluation model (IFRIC 3 rev).
(3) Cost of settlement approach with allocated allowances measured at fair value at grant date (CoS).
(4) Net liability approach with allocated allowances measured at a nominal amount of nil value (NLA).

Under each of the four alternative methods, three scenarios are considered:

(A) Granted allowances equal the emissions made during the year.
(B) Granted allowances are insufficient to cover the emissions made during the year (deficit of allowances).
(C) Granted allowances exceed the emissions made during the year (surplus of allowances).

Table 2-3: Impact on annual financial statements of GHG emission allowances accounted under full market value and remainder value approaches – positions before settlement

Background

Emission allowances held for compliance purposes

Annual compliance periods that coincide with firm's reporting periods

Year 1

Jan,1	Allowances granted free of charge	10 000 tones
	Market price of allowances at grant date	10 CU per ton
Dec,31	Market price of allowances at the year-end	11 CU per ton

Scenario A - Emissions made during Year 1: 10 000 tones

	IFRIC 3	**IFRIC 3 rev**	**CoS**	**NLA**
BALANCE SHEET (partial)	31 Dec Year1	31 Dec Year1	31 Dec Year1	31 Dec Year1
Intangible assets - emission allowances	100 000	110 000	100 000	0
Total assets	100 000	110 000	100 000	0
Revaluation surplus	-	10 000	-	-
Net profit (loss) for the year	(10 000)	(10 000)	0	0
Provisions | Liability to deliver allowances	110 000	110 000	100 000	0
Total equity and liabilities	100 000	110 000	100 000	0
INCOME STATEMENT (partial)	Year 1	Year 1	Year 1	Year 1
Income - release of government grant	100 000	100 000	100 000	0
Provisions | Emissions expense	(110 000)	(110 000)	(100 000)	0
Net profit (loss) for the year	(10 000)	(10 000)	0	0

Scenario B - Emissions made during Year 1: 11 000 tones

	IFRIC 3	**IFRIC 3 rev**	**CoS**	**NLA**
BALANCE SHEET (partial)	31 Dec Year1	31 Dec Year1	31 Dec Year1	31 Dec Year1
Intangible assets - emission allowances	100 000	110 000	100 000	0
Total assets	100 000	110 000	100 000	0
Revaluation surplus	-	10 000	-	-
Net profit (loss) for the year	(21 000)	(21 000)	(11 000)	(11 000)
Provisions | Liability to deliver allowances	121 000	121 000	111 000	11 000
Total equity and liabilities	100 000	100 000	100 000	0
INCOME STATEMENT (partial)	Year 1	Year 1	Year 1	Year 1
Income - release of government grant	100 000	100 000	100 000	0
Provisions | Emissions expense	(121 000)	(121 000)	(111 000)	(11 000)
Net profit (loss) for the year	(21 000)	(21 000)	(11 000)	(11 000)

Scenario C - Emissions made during Year 1: 9 000 tones

	IFRIC 3	**IFRIC 3 rev**	**CoS**	**NLA**
BALANCE SHEET (partial)	31 Dec Year1	31 Dec Year1	31 Dec Year1	31 Dec Year1
Intangible assets - emission allowances	100 000	110 000	100 000	0
Total assets	100 000	110 000	100 000	0
Revaluation surplus	-	10 000	-	-
Net profit (loss) for the year	(9 000)	(9 000)	0	0
Provisions | Liability to deliver allowances	99 000	99 000	90 000	0
Government grant	10 000	10 000	10 000	0
Total equity and liabilities	109 000	109 000	100 000	0
INCOME STATEMENT (partial)	Year 1	Year 1	Year 1	Year 1
Income - release of government grant	90 000	90 000	90 000	0
Provisions | Emissions expense	(99 000)	(99 000)	(90 000)	0
Net profit (loss) for the year	(9 000)	(9 000)	0	0

IFRIC 3 - IFRIC 3 cost model | IFRIC 3 rev - IFRIC 3 revaluation model

CoS - Cost of settlement approach with granted allowances measured at FV at grant date

NLA - Net liability approach with granted allowances measured at a nominal amount of nil value

Table 2-4: Impact on annual financial statements of GHG emission allowances accounted under full market value and remainder value approaches – positions after settlement

Background

Emission allowances held for compliance purposes

Annual compliance periods that coincide with firm's reporting periods

Year 2

Jan,1 Aquisition of missing allowances|Sale of surplus of allowances 1 000 tones | 11 CU per ton

Apr,30 Surrender of allowances to cover actual emissions made in Year 1

Scenario A - Emissions made during Year 1: 10 000 tones

No acquisition or sale of allowances occurred

	IFRIC 3	**IFRIC 3 rev**	**CoS**	**NLA**
BALANCE SHEET (partial)	30 April Year 2	30 April Year 2	30 April Year 2	30 April Year 2
Intangible assets - emission allowances	0	0	0	0
Total assets	0	0	0	0
Revaluation surplus	-	10 000	-	-
Retained earnings	(10 000)	(10 000)	0	0
Net profit (loss) for the year	10 000	0	0	0
Provisions | Liability to deliver allowances	0	0	0	0
Total equity and liabilities	0	0	0	0

Scenario B - Emissions made during Year 1: 11 000 tones

Acquisition of missing allowances at 1 Jan Year 2: 1 000 tones | 11 CU per ton

	IFRIC 3	**IFRIC 3 rev**	**CoS**	**NLA**
BALANCE SHEET (partial)	30 April Year 2	30 April Year 2	30 April Year 2	30 April Year 2
Intangible assets - allowances	0	0	0	0
Cash and cash equivalents	(11 000)	(11 000)	(11 000)	(11 000)
Total assets	(11 000)	(11 000)	(11 000)	(11 000)
Revaluation surplus	-	10 000	-	-
Retained earnings	(21 000)	(21 000)	(11 000)	(11 000)
Net profit (loss) for the year	10 000	0	0	0
Provisions | Liability to deliver allowances	0	0	0	0
Total equity and liabilities	(11 000)	(11 000)	(11 000)	(11 000)

Scenario C - Emissions made during Year 1: 9 000 tones

Sale of surplus of allowances at 1 Jan Year 2: 1 000 tones | 11 CU per ton

	IFRIC 3	**IFRIC 3 rev**	**CoS**	**NLA**
BALANCE SHEET (partial)	30 April Year 2	30 April Year 2	30 April Year 2	30 April Year 2
Intangible assets - allowances	0	0	0	0
Cash and cash equivalents	11 000	11 000	11 000	11 000
Total assets	11 000	11 000	11 000	11 000
Revaluation surplus	-	10 000	-	-
Retained earnings	(9 000)	(9 000)	0	0
Net profit (loss) for the year	20 000	10 000	11 000	11 000
Provisions | Liability to deliver allowances	0	0	0	0
Deferred income - government grant	0	0	0	0
Total equity and liabilities	11 000	11 000	11 000	11 000

IFRIC 3 - IFRIC 3 cost model | IFRIC 3 rev - IFRIC 3 revaluation model

CoS - Cost of settlement approach with granted allowances measured at FV at grant date

NLA - Net liability approach with granted allowances measured at a nominal amount of nil value

For clarity of exposition, the analysis is focused only on allowances held for compliance purposes. Acquisitions or sales of allowances held-for-trading were not considered in this illustrative example, but the existence of such transactions would not change the points made below. It should be noted that it is beyond the scope of this study to fully illustrate all methods currently in use to report GHG emission allowances in annual accounts[20]. Otherwise, the aim is only to enhance how diverging accounting practices are likely to reduce comparability of firms' accounts, unless detailed information (enough to reconcile the different methods) is provided in the annex.

According to the IFRIC 3 cost model (IFRIC 3), allowances granted at no cost are measured at fair value at grant date whereas the liability to deliver allowances is measured at fair value at the balance sheet date. This mixed measurement leads to the appearance in the income statement of a profit or loss due to changes in allowances' market price during the period. That is, because the liability to deliver allowances is fully measured at market price at the period end (regardless whether the allowances are in hand or have to be purchased from the market), even when the number of allowances granted free of charge equals actual emissions (Table 2-3 | scenario A | IFRIC 3), a loss (10 000 CU) is recognized because the market price of allowances has increased (from 10 to 11 CU) during the period. This loss will be compensated in the following year by the recognition, in the income statement, of a profit of the same amount on the settlement of the obligation (Table 2-4 | scenario A | IFRIC 3). Meanwhile, at period end, results are affected by this measurement mismatch. Hence, volatility in earnings can arise from valuing the entire obligation at the prevailing market price of allowances at the balance sheet date.

Under the IFRIC 3 revaluation model (IFRIC 3 rev) there is no inconsistency on valuation criteria since both the allowances and the correspondent liability are measured at fair value at the balance sheet date. Considering the situation where the number of allowances granted free of charge equals actual emissions (Table 2-3 | scenario A | IFRIC 3 rev) comprehensive income equals zero. However, as revaluation gains are recognized directly in equity while expenses and income related to emissions are

[20] Refer to PwC and IETA (2007), Warwick and Ng (2012), Black (2013), and Haupt and Ismer (2013) for a survey of existing reporting practices currently applied by the participants in the EU-ETS.

recognized in the profit or loss account, a revaluation surplus (10 000 CU) is registered in equity whereas a net loss of the same amount (10 000 CU) is recorded in the income statement (Table 2-3 | scenario A | IFRIC 3 rev). This discrepancy goes beyond the end of the compliance period, since it is not permitted to bring the revaluation surplus and the restatement of the net expenses, together, in the income statement at the settlement of the obligation in the following year (Table 2-4 | scenario A | IFRIC 3 rev).

In order to mitigate the mixed measurement mismatch originated by IFRIC 3, most firms adopted the "remainder value approach" either on a gross (CoS) or net (NLA) basis.

As mentioned before, under IFRIC 3 the liability is entirely measured at market price at period end, regardless whether the allowances are in hand or have to be purchased from the market. Differently, under the "remainder value approach" the portion of the liability relating to allowances held is measured at the carrying amount of those allowances and only the liability relating to any excess of emissions is measured at market price of allowances at the balance sheet date. In particular, where allowances granted for free are measured at a nominal amount of nil value (NLA) a liability corresponding to the expected cost of allowances that have to be purchased to cover the shortfall is only recognized to the extent that actual emissions exceed free allocations (Table 2-3 | scenario B | NLA). Otherwise, no accounting entries are made (Table 2-3 | scenarios A and C | NLA).

When compared with the "gross cost of settlement approach" (CoS), where granted allowances are measured at their fair value at grant date, the "net liability approach" (NLA) where granted allowances are measured at nil value, leads to an under-representation of the balance sheet and the income statement, although both procedures arrive at same net profit or loss for the year (Table 2-3 | scenarios A, B, C | CoS, NLA). When compared with the IFRIC 3 approach, dissimilarities are evident either in the statement of financial position and in the results for the year.

Further differences can arise under the "remainder value approaches" (CoS and NLA) since the amount of the liability and the associated emissions expense will depend on whether allowances held are discharged on a FIFO or on a weighted average cost basis,

being that the impact on the financial statements will also depend whether the firm reports quarterly or half-yearly results or whether the financial year coincide, or not, with the annual compliance period.

The proximity of the EU-ETS third trading period (2013-2020) brought again into discussion the accounting for emission rights. In May 2012, the French accounting standard-setting body (Autorité des Normes Comptables - ANC) issued the Discussion Paper *Proposals for Accounting of GHG Emission Rights reflecting companies' business models* (ANC, 2012) that intend to contribute to the launch of an international accounting standard by the IASB. Based on the ANC's (2012) proposal, the EFRAG issued the Draft Comment Paper *Emissions Trading Schemes*, in December 2012. A feedback statement on this draft comment paper was released in November 2013, and, resulting from this process, EFRAG recommendations will be presented to the IASB.

ANC (2012) and EFRAG (2012) agreed that specific accounting guidance was required because the withdrawal of IFRIC 3 has resulted in diverging practices, reducing comparability of information. Moreover, both papers remark that, although GHG emission allowances exhibit similar characteristics to inventory and intangible assets, due to their specific nature and innovative features, no perfect analogy can be drawn from existing IFRS.

On one hand, emission allowances are similar to commodities in the sense that entities participating in EU-ETS use these rights in their production process. Because they can be held for sale or to settle the obligation arising from the production process of the entity, emission allowances could meet the definition of inventories in IAS 2 *Inventories* (IAS 2). However, it is not possible to draw a perfect analogy to inventory because the rights are not physically consumed during the production process and the entity can complete production without obtaining the emission allowances first (EFRAG, 2012, § 16). On the other hand, emission allowances are similar to intangible assets in the sense that they are identifiable non-monetary assets without physical substance. However, their linkage with the obligation to return a number of allowances to cover emissions made over the compliance period is an additional specific feature that differentiates them from other types of assets (EFRAG, 2012, § 25). In view of this, there is a general consensus that explicit guidance should be developed for emissions

trading schemes because they have specific characteristics that existing standards do not easily accommodate (EFRAG, 2012, § 26).

Table 2-5: Proposals of ANC (2012) and EFRAG (2012) for the recognition and measurement of GHG emission allowances under the compliance model

	ANC (2012)	EFRAG (2012)
Allowances	Free allocations are initially measured at a nominal amount of nil value.	Free allocations should be initially recognized at fair value at grant date, being that is yet to determine if the other side of the entry will be deferred income or other comprehensive income (OCI).
	Free allocations are carried at a nominal amount of nil value. Purchased allowances are carried at cost less impairment.	Allowances held (free allocations or purchased allowances) are carried at cost less impairment (the deemed cost of free allocations being their initial fair value).
	Purchased allowances are expensed, as production costs, as the entity emits GHG.	When surrendering the allowances, an entity should derecognize the liability and the allowances surrendered.
Deferred income or OCI	Not applicable	The deferred income is released (or the other comprehensive income is recycled) as a negative production cost, ensuring that the profit and loss shows a production cost that reflects the real cost of the scheme for the entity.
Liability	A liability is recognized (against a production cost) when, and only when, the entity has emitted more than its holding rights.	A liability and a production cost is recognized as the entity produces emissions.
	The liability is valued at the fair value of emission allowances, unless the firm has fixed the purchased price with a forward contract (in such case, the liability is first valued using the purchase price of the contract entered into the compliance period, and then for any residual excess using the market value on the date the liability is recognized).	The liability is measured at the expected weighted average cost for the year determined as the average of the carrying amount of the allowances held for compliance (free and purchased), plus the purchase price of forward contracts entered into for compliance period, and for any residual excess, the current market value at the reporting date.
	The liability is discharged by the purchase of allowances.	When surrendering the allowances, an entity should derecognize the liability and the allowances surrendered.

Source: Discussion Paper *Proposals for Accounting of GHG Emission Rights reflecting companies' business models* (ANC, 2012) | Draft Comment Paper *Emissions Trading Schemes* (EFRAG, 2012)

Also, there is general acceptance that the accounting model should depend on whether firms are going to use (purchased) allowances for compliance or trading purposes.

As regards the trading model, both papers conclude that emission allowances should be initially and subsequently measured at fair value (with changes recognized in the income statement) to reflect the fact that they were purchased voluntarily and are held for trading. Otherwise, with respect to the compliance model, ANC (2012) and EFRAG (2012) show dissenting views, as summarized in Table 2-5. In particular, by linking the measurement of the liability to the carrying amount of the allowances held, both proposals intend to reduce the accounting mismatches which were created under the IFRIC 3 approach. However, unlike the ANC's (2012) model where free allocations are measured at nil value and a liability is recognized if, and only if, the entity has emitted more than its holding rights, the EFRAG's (2012) model adopts a "gross liability approach", reporting separately the (entire) liability incurred and the assets held to meet this obligation. The underlying reason is to provide the information that users need to project future cash flows (EFRAG, 2012, § 37), namely:

- The cost of pollution that the entity bears due to its activities.
- The gain that free allowances represent (this being depicted in each accounting period as the best possible representation of the real monetary cost to the entity).
- How the entity can face its surrendering obligation.

As concerns disclosure, except for the information to justify the firm's business model (ANC, 2012, section V), none of the two papers covers the issue directly. Nonetheless, EFRAG (2012, § 108-f) believes that specific disclosure requirements, in addition to those existing in the current standards, will be necessary for emissions trading schemes.

Meanwhile, at national level, some dispositions on how to report GHG emission allowances were issued by local regulatory bodies. Next section summarizes existing guidance in EU-15 Member States during the research period.

2.3.2. Overview at national level

The present overview of national accounting guidance for GHG emission allowances is based on European Environment Agency technical reports concerning the application of the EU-ETS Directive by EU Member States[21], as well as official data collected from the websites of national accounting standard-setting bodies, and information provided in firms' annual reports. Table 2-6 summarizes country status, over the research period.

Table 2-6: EU-15 national accounting guidance on GHG emission allowances (2005-2012)

Specific guidance on accounting for GHG emission allowances at national level (2005 - 2012)	**Type of guidance for entities under IFRS**	
	Recognition Measurement	**Disclosure**
Denmark, Greece, Ireland, Italy, Luxembourg, Netherlands, Sweden, United Kingdom (1) No specific guidance	X	X
Austria Opinion of 22.2.2006, AFRAC	V	V d
Belgium Avis CNC 179/1 of 1.8.2005 Avis CNC 179/1 of 26.11.2008 (update)	V	V d
Finland Opinion KILA Nº 1767/2005 of 15.11. 2005 (2)	V	V D
France Avis du CU Nº 2004-C of 23.3.2004 Recommendation N°2009-R-02 of 5.03.2009	V	V d
Germany Opinion IDW RS HFA Nº 15 of 2.3.2005	V	V d
Portugal Technical Interpretation IT Nº 4 of 26.4.2006 Accounting standard NCRF Nº 26 of 7.9.2009	V	V D
Spain Resolution of 8.2.2006, ICAC	M	M D

X – No specific guidance on how to report GHG emission allowances in the annual accounts.
V – Guidance not mandatory for entities under IFRS.
M – Guidance mandatory for all entities operating installations linked to the Spanish allowances allocation plan, regardless if they draw up their financial statements under national GAAP or under IFRS.
D – Guidance comprising detailed items to be reported in the annex (refer to Table 2-9).
d – Guidance addressing the accounting policies to be adopted for GHG emission allowances, but not specifying detailed items to be reported in the annex (refer to p. 34).
(1) The Financial Reporting Advisory Board has issued guidance, based in the IFRIC 3, only to public sector installations under the Government's Financial Reporting Manual.
(2) Later included in the "General guidelines for environmental issues and the presentation of the financial statements" issued in 24/10/2006 by the Finnish accounting standard-setting body (KHT-yhdistys).

[21] Available at http://www.eea.europa.eu/publications/technical_report_2008_13. Last accessed on 19 July 2014.

From 2005 to 2012, in seven EU-15 Member States (Denmark, Greece, Ireland, Italy, Luxembourg, Netherlands, and Sweden) no particular guidance specifying how to apply the existing accounting standards to "cap and trade" schemes was provided. In the United Kingdom, the Financial Reporting Advisory Board published guidance, based in the IFRIC 3, intended only to public sector installations under the Government's Financial Reporting Manual. As regards the remaining seven EU-15 Member States (Austria, Belgium, Finland, France, Germany, Portugal, and Spain) regulatory bodies have issued specific accounting guidelines on how to report GHG emission allowances in the annual accounts. Among the guidance issued at national level, in six EU-15 Member States (Austria, Belgium, Finland, France, Germany, and Portugal) the accounting dispositions on GHG emission allowances are only relevant for operators which draw up their financial statements according to national GAAP. Differently, in Spain, the Resolution ICAC (2006) also applies to firms under IFRS in the extent that it is mandatory to every firm that has been awarded GHG emission allowances through the Spanish National Allocation Plan (ICAC, 2006, § 1).

Concerning the scope, all the guidance provided at national level addresses recognition and measurement criteria, being that the accounting model varies across countries as described in Table 2-7 (main features) and Table 2-8 (illustrative example):

- The Finnish guidelines follow the "net liability approach" (NLA), with free allowances measured at nil value, and the obligation to surrender allowances recognized when, and only when, actual emissions exceed free allocations.
- The French and Spanish guidelines establish the "gross liability approach" (CoS) with free allowances recognized at fair value at grant date, and the obligation to surrender allowances measured according the "remainder value approach".
- The Portuguese guidance, in its latest version (CNC, 2009 | NCRF 26), follows a variant of the "remainder value approach" where free allowances are recognized at fair value at grant date, but existing allowances are amortized, and a provision is recognized when, and only when, actual emissions exceed allowances held.
- The Austrian, Belgian, and German guidelines allow either the "gross liability approach" or the "net liability approach", being that in the Austrian and German models allowances are classified as inventory or other current assets.

Table 2-7: Main features of EU-15 national guidelines for the recognition and measurement of GHG emission allowances (2005-2012)

	Belgium **France** **Portugal** (IT 4) **Spain**	**Belgium** **Finland**	**Portugal**	**Austria** **Germany**	
	CoS	**NLA**	**NCRF 26 model**	**AFRAC | IDW models**	
	FV at grant date --- Prov | O. Liab gross method	Nominal amount --- Provisions net method	FV at grant date Amortization Provisions net method	FV at grant date --- Provisions gross method	Nominal amount --- Provisions net method
Allowances					
Recognition	Intangible assets	Intangible assets	Intangible assets	Inventory | Other current assets	
Initial measurement	Granted allowances: Fair value at grant date	Granted allowances: Nominal amount of nil value	Granted allowances: Fair value at grant date	Granted allowances: Fair value at grant date	Granted allowances: Nominal amount of nil value
	Purchased allowances: Cost	Purchased allowances: Cost	Purchased allowances: Cost	Purchased allowances: Cost	Purchased allowances: Cost
Subsequent measurement	Granted and purchased allowances: Cost less impairment losses (the deemed cost of granted allowances being their initial fair value)	Granted allowances: Nominal amount of nil value Purchased allowances: Cost less impairment losses	Granted and purchased allowances: Cost less amortization and impairment losses (the deemed cost of granted allowances being their initial fair value)	Granted and purchased allowances: Lower of cost or market (the deemed cost of granted allowances being their initial fair value)	Granted allowances: Nominal amount of nil value Purchased allowances: Lower of cost or market
Government Grant					
Recognition	As deferred income	Not aplicable	As other changes in equity	As deferred income	Not aplicable
Initial measurement	Fair value at grant date	Not aplicable (nil value)	Fair value at grant date	Fair value at grant date	Not aplicable (nil value)
Subsequent measurement	Release of government grants when expenses relating to granted allowances are recognized	Not aplicable (nil value)	Release of government grants when expenses relating to granted allowances are recognized	Release of government grants when expenses relating to granted allowances are recognized	Not aplicable (nil value)
Liability	Prov | O. Liab - Gross method First carrying value of allowances granted, then of the allowances purchased, and fair value | best estimate | market value | at balance sheet date for missing allowances	Provisions - Net method First carrying value of allowances granted (nil value), then of allowances purchased, and fair value at balance sheet date for missing allowances	Provisions - Net method If, and only if, there is a shortfall of allowances, a provision is made for the best estimate of the cost to be incurred to cover the missing allowances	Provisions - Gross method First carrying value of allowances granted, then of allowances purchased, and market value at balance sheet date for missing allowances	Provisions - Net method First carrying value of allowances granted (nil value), then of allowances purchased, and market value at balance sheet date for missing allowances

Table 2-8: EU-15 national guidelines for the recognition and measurement of GHG emission allowances (2005-2012) – Illustrative example

Background	**Belgium**	**Belgium**	**Portugal**	**Austria**	
Allowances granted free of charge	**France**	**Finland**		**Germany**	
10 000 tones	**Portugal** (IT 4)				
Emissions made during the year	**Spain**				
9 000 tones	**CoS**	**NLA**	**NCRF 26 model**	**AFRAC | IDW models**	
Market price of allowances	FV at grant date	Nominal amount	FV at grant date	FV at grant date	Nominal amount
At grant date 10 CU per ton	---	---	Amortization	---	---
Positions before settlement	Prov | O.Liab gross method	Provisions net method	Provisions net method	Provisions gross method	Provisions net method
BALANCE SHEET at year-end (partial)					
Intangible assets	100 000	0	10 000	---	---
Inventories | Other current assets	---	---	---	100 000	0
Total assets	100 000	0	10 000	100 000	0
Net profit (loss) for the year	0	0	0	0	0
Deferred income | Other changes in equity	10 000	0	10 000	10 000	0
Provisions | Other liabilities	90 000	0	0	90 000	0
Total equity and liabilities	100 000	0	10 000	100 000	0
INCOME STATEMENT (partial)					
Income - release of government grant	90 000	0	90 000	90 000	0
Provisions | Emissions expense | Other operating expenses	(90 000)	0	0	(90 000)	0
Amortization	---	---	(90 000)	---	---
Net profit (loss) for the year	0	0	0	0	0

With regard to disclosure, the guidance issued in Spain, Portugal, and Finland specifies detailed requirements for information to be provided in the annex, covering qualitative and quantitative data, as summarized in Table 2-9. The information to be delivered in the annual accounts according to the Resolution ICAC (2006) will be the basis for the construction of the disclosure index in chapter 5. Similar dispositions for disclosure can be found in the Portuguese and Finnish standards, namely requiring information (in currency units and in physical units - CO2 tones) covering granted allowances, actual emissions, acquisitions and sales of allowances, evolution of allowances' market prices, and impact on performance and financial position. Differently, the guidance provided in Austria, Belgium, France and Germany does not set out clearly (item-by-item) the information to be reported in the annex:

- In Austria (where both a "gross liability approach" and a "net liability approach" are permitted), AFRAC Opinion (2006, § 8.3) indicates that the method of accounting and the measurement criteria "are explained in the annex", but no further requests or details on items to be reported in the explanatory notes are mentioned.
- In Belgium (where both a "gross liability approach" and a "net liability approach" are permitted), Avis CNC 179/1 (2005, p. 10; 2008 update, p. 9) establishes that it should be included in the annex a "sufficiently detailed summary" with information allowing to assess the accounting method adopted, but no further requests or details on items to be reported in the annex are indicated.
- In France (where only a "gross liability approach" is allowed), Recommendation 2009-R-02 (2009, § 4) put forward that the "assumptions to estimate" future GHG emissions as well as "relevant information" on CO2 risk management are included in the annex, but no further requests or details on items to be reported in the explanatory notes are set out.
- In Germany (where both a "gross liability approach" and a "net liability approach" are permitted), Opinion IDW RS HFA Nº 15 (IDW, 2005, § 26) recommends that the method of accounting and measurement criteria are explained in the annex, namely the criteria for the measurement of allowances free of charge, but no further requests or details on items to be reported in the explanatory notes are specified.

Table 2-9: Information on GHG emission allowances to be provided in the annex to the annual accounts according to Spanish, Portuguese and Finnish guidelines

Information to be provided in the annual account in addition to dispositions already imposed by the relevant existing standards

Spain Resolution ICAC (2006, §9)	**Portugal** IT 4 (2006, §7) NCRF 26 (2009, §12)	**Finland** KILA 1767 (2005, §3) GG (2006, Appendix 5)
1. Accounting policies Criteria for the valuation of GHG emission allowances. Criteria for the assignment to results of the expenses arising from GHG emission.	√	√
2. Other explanatory notes - separate note on GHG emission allowances:		
a) Emission allowances allocated under NAP:		
- Amount (CO_2 tones) of allowances allocated during the period of validity of National Allocation Plan (2005-2007 | 2008-2012).	√	√
- Annual distribution of allocated emission allowances (CO_2 tones).	√	√
- Information on whether the assignment has been free or paid.	√	√
b) Analysis of the movements of emission allowances during the year, including any impairment losses that might correct the carrying amount, detailing:		
- The carrying amount at the beginning of the year.	√	√
- Acquisitions and other increases.	√	√
- Disposals and other decreases.	√	√
- The carrying amount at the end of the year.	√	√
c) Expenses resulting from GHG emissions, by specifying its calculation.	√	√
d) Amount of the Provision for GHG emissions, specifying the amount that proceeds by deficits of emission allowances within it, where appropriate.	√	√
e) Information on futures contracts on GHG emission allowances.	X	X
f) Government grants received by allocated emission allowances, specifying the amount recognized in profit or loss during the year.	√	N.a.
g) Contingencies related to fines or other sanctions pursuant the EU-ETS law.	√	X
h) The fact of being part of a group of facilities under EU-ETS, where appropriate.	X	X

Source: Resolution of 8.2.2006, ICAC, Spain. Technical Interpretation IT Nº 4 of 26.4.2006, and Accounting standard NCRF Nº 26 of 7.9.2009, CNC, Portugal. Opinion KILA Nº 1767/2005 of 15.11.2005, and General guidelines for environmental issues and the presentation of the financial statements of 24/10/2006 (GG), KHT-yhdistys, Finland. Translation is made by the author. √ - Required | X – Not required | N.a. – Not applicable.

In summary, as regards disclosure, Austrian, Belgian, French, and German guidance refer mainly to descriptive information on the accounting treatment and the valuation methods applied, being that their requests are formulated in a more vague (imprecise) way than the demands made by the Spanish, Portuguese, and Finnish guidelines.

Next table summarizes EU-15 national accounting guidance on GHG emission allowances for EU-ETS participants under IFRS, according the type of requirement (mandatory versus not mandatory), and the type of disclosure (detailed versus not detailed), over the research period.

Table 2-10: Synthesis of EU-15 national accounting guidance on GHG emission allowances for entities under IFRS (2005-2012)

Country	Type of requirement for entities under IFRS	Type of guidance on disclosure items
Spain	Mandatory	Detailed
Finland, Portugal	Not Mandatory	Detailed
Austria, Belgium, France, Germany	Not Mandatory	Not Detailed
Denmark, Greece, Ireland, Italy, Luxembourg, Netherlands, Sweden, UK	No Guidance	---

Previous studies on mandatory disclosure remark that simply creating additional reporting regulation will not necessarily lead to real change in disclosure, unless such requirements are clearly delineated (Criado-Jiménez *et al*., 2008; Peters and Romi, 2013). Expanding prior research, this study intends to examine if formal guidance (mandatory or not) is an incentive for additional information especially when setting out straight requests on items to be provided in the annex, and evaluate if such guidelines are likely to enhance the harmony of disclosure practices relating to GHG emission allowances. For this purpose, a review of literature on the harmonization of financial reporting is presented in the next chapter.

3. Harmonization of financial reporting

This chapter presents a review of literature related to the measurement of harmonization of financial reporting, addressing in particular the operationalization of the concept of de facto accounting harmony.

3.1. The concept of accounting harmonization

The concept of international accounting harmonization arose in the middle of the twentieth century in response to economic integration after World War II, and corresponding increases in capital flows between countries. At first, efforts were focused on reducing differences among the accounting principles used in major capital markets around the world. Then, international accounting harmonization became an objective of modern accounting (Baker and Barbu, 2007; Barlev and Haddad, 2007), and the term international accounting harmonization has been used to describe a process of reducing accounting differences among countries.

Literature generally distinguishes between accounting *harmonization* and accounting *standardization* (Tay and Parker, 1990; Taplin, 2011; Cole *et al*., 2009, 2012), being that both concepts involve a reduction in accounting diversity. The difference between them lies in their relative flexibility or strictness.

The concept of harmonization has been defined in many different ways. For Tay and Parker (1990), harmonization of financial reporting is a process involving movement away from total diversity towards a state of harmony indicated by a concentration of firms around one or a few of the available accounting choices. Whereas harmonization is a process, harmony is a state at a given point in time. As presented by Tay and Parker (1990, p. 73), the concept of harmony comprehends any state between total diversity and uniformity, excluding these two extreme situations.

Standardization is also a process involving movement away from total diversity but implies a more strict approach resulting ultimately in a state of total uniformity. At an international level, standardization implies uniform standards in all countries while harmonization encompasses a reconciliation of different requirements in individual countries under compatible conceptual frameworks.

It is generally accepted that standardization is a process of uniformity while harmonization is a process of coordination, but to avoid confusion over this two concepts authors like Taplin (2011, pp. 384-385) prefer to use the term "comparability" in place of the more traditional term "harmony". On the other hand, since the 1990s, the concept of harmonization has been sometimes replaced by the concept of convergence, when referring to the removal of existing dissimilarities, and the "development of high-quality, compatible accounting standards that could be used for both domestic and cross-border financial reporting" (IASB, 2002 | The Norwalk Agreement).

Standardization, uniformity, harmonization, and harmony can exist both at the level of regulation and practice. As stated in previous literature (van der Tas, 1988, 1992a, 1992b; Tay and Parker, 1990, 1992), both states (uniformity, harmony) and processes (standardization, harmonization) may be either *de jure* (formal) or *de facto* (material). The former refers to accounting standards, statutory rules or stock exchange regulations and the latter relates to the actual practices of firms. This study is concerned with *de facto* (material) accounting harmonization as a way to assess any progress in the comparability of financial statements to users.

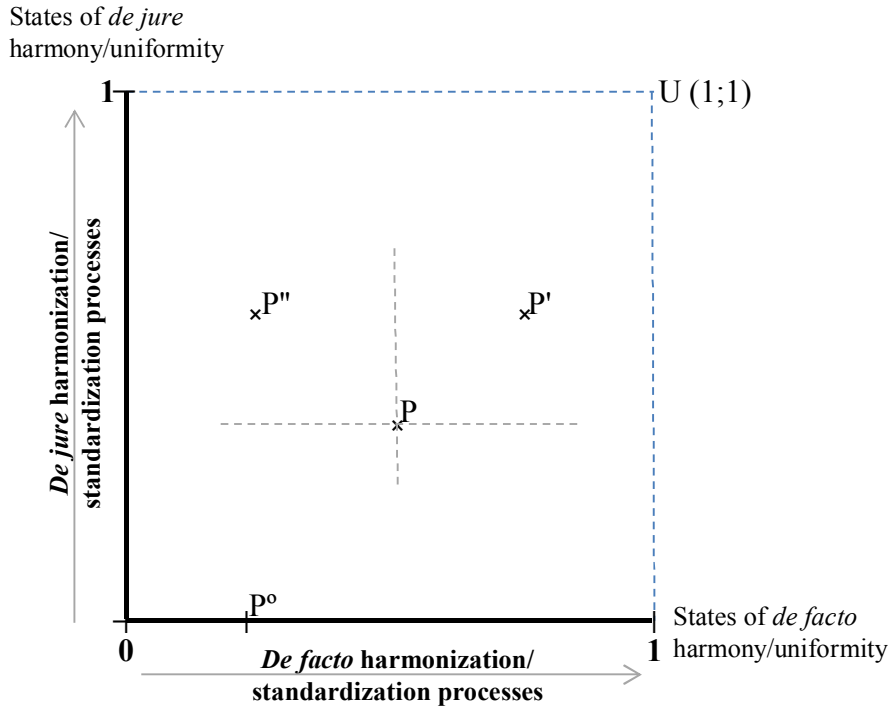
Figure 3-1 presents possible combinations between states of *de jure* (formal) and *de facto* (material) harmony. One purpose of accounting standard-setting bodies is to promote the convergence of accounting practices through the convergence of accounting regulations. When this goal is achieved *de jure* (formal) harmonization leads to *de facto* (material) harmonization. *De jure* (formal) and *de facto* (material) harmony will coexist, in some extent, at a given point in time, and formal and material harmonization processes will lead to higher levels of harmony (e.g., fig.3-1, P → P').

But the existence of formal harmonization does not assure, by itself, the comparability of accounting information. Even when compliance with regulations is legally required, firms may not comply if it is perceived that the consequences of non-compliance are not serious. So, the diversity of practices may subsist despite the existence of standardized rules. Moreover, formal harmonization may lead to material disharmonization when standards evolve allowing more options for firms (e.g., fig. 3-1, P → P").

On the other hand, the diversity or the absence of accounting standards does not

necessarily imply the diversity of practices. Some research (van der Tas, 1988; Tay and Parker, 1990; Cairns, 1997; Cañibano and Mora, 2000; Aisbitt, 2001; Land and Lang, 2002) suggests that convergence may occur by a process of voluntary or spontaneous harmonization when most firms consider that it is of their convenience (e.g., fig. 3-1, Pº).

Figure 3-1: Possible combinations of *de jure* and *de facto* harmony

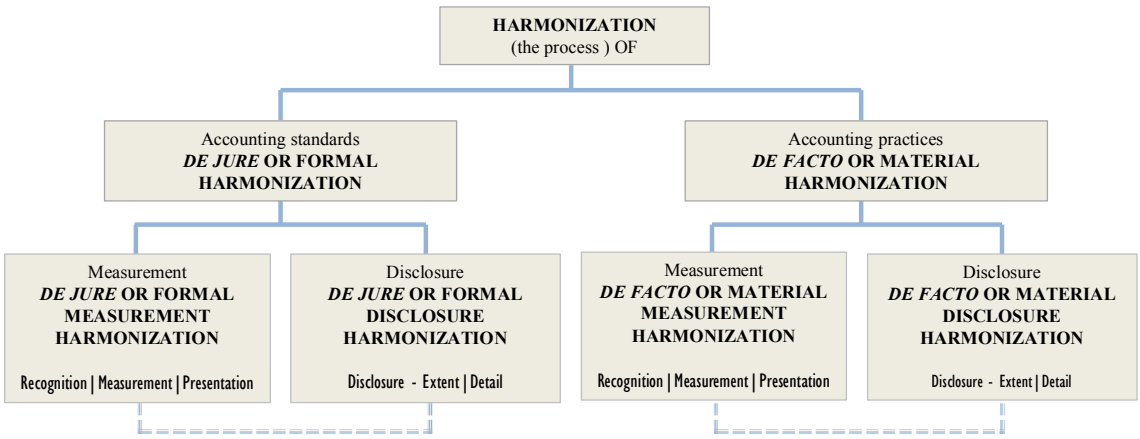


Source: Author's elaboration.

Either formal and material harmonization or standardization may refer to measurement or to disclosure issues. In general, studies on measurement harmonization evaluate the way in which transactions and events are reflected in the financial statements, while investigation concerned with harmonization of disclosure considers the extent and detail of the information provided in the annex[1]. Figure 3-2 illustrates the concepts of *de jure* (formal) and *de facto* (material) harmonization applied to these two dimensions of financial reporting (measurement and disclosure).

[1] Refer to Rahman *et al*. (2002) for a comprehensive classification of accounting harmonization studies that comprehends six (not mutually exclusive) categories: regulation studies; practices studies, clusters studies; association studies; relevance studies; and methodology studies.

Figure 3-2: The concept of accounting harmonization



Source: Adapted from Cañibano and Mora (2000, p. 352)

Measurement and disclosure harmonization are both required for the comparability of financial statements. Actually, there appears to be general agreement that the assessment of the level of measurement harmony itself is not sufficient to evaluate the overall level of harmony in accounting information (Grove and Bazley, 1993; Ali, 2006). In particular, when alternative measurement criteria are allowed or when the method of presentation in the financial statements is the offset of positions (as currently happens in accounting for GHG emission allowances) disclosure plays an essential role for the comparability of firms' accounts[2].

While numerous studies have been conducted on the harmonization of measurement practices, research on the harmonization of disclosure is scarce (Emenyonu and Gray, 1996; Ali, 2006). The present analysis fills this gap by evaluating the level of *de facto* (material) disclosure harmony on GHG emission allowances in the annual accounts of EU-15 firms and identify any progress towards harmonization among them. As pointed out by Tay and Parker (1990, p. 73), it is difficult to measure a process. For that reason, to ascertain the evolution in (the process of) accounting harmonization, empirical research tries to measure states of harmony at different points in time. Section 3.2 discusses the operationalization of this concept in related literature.

[2] In view of this, the Financial Accounting Standards Board (FASB) issued ASU 2011-11 *Balance Sheet (Topic 210): Disclosures about Offsetting Assets and Liabilities*, and ASU 2013-01 *Balance Sheet (Topic 210): Clarifying the Scope of Disclosures about Offsetting Assets and Liabilities*, requiring entities to disclose both gross and net information about those instruments and transactions eligible for offset in the statement of financial position. The purpose is to facilitate comparisons between entities that prepare their financial statements under US GAAP and entities under IFRS.

3.2. Operationalization of the concept of *de facto* accounting harmonization

3.2.1. Introduction

Initially, empirical studies had not computed a single measure of harmony. Instead, they relied only on descriptive statistics to analyze the comparability of accounting information (Choi and Bavishi, 1982; Evans and Taylor, 1982; Mckinnon and Janell, 1984). To overcome this limitation, van der Tas (1988) suggested three indices of harmony that are intended to quantify the degree to which accounts are comparable:

- The H index to measure national harmony.
- The C index to measure harmony where there is multiple reporting.
- The I index to measure international harmony.

Earlier developed to measure the degree of concentration in industrial economics research, the H index (or Herfindahl index) was introduced by van der Tas (1988) as a measure of harmony in accounting literature, with the underlying notion that a higher level of harmony is achieved when firms' choices concentrate on one or few accounting alternatives. Hence, comparability increases when the choices made by firms converge towards a generally accepted method or when the number of accounting methods in use is reduced.

The formula of the H index, as presented by van der Tas (1988, p. 159), is as follows:

$$H\ index = \sum_{i=1}^{n} pi^2 \qquad (3\text{-}1)$$

where:
n represents the number of alternative accounting methods
p_i represents the relative frequency of accounting method *i*

Considering that p*i* is the probability that two firms randomly selected from the sample, independently (with replacement of the first firm before selecting the second firm), both use the same accounting method *i*, it therefore follows that H index equals the probability that two firms randomly selected (with replacement) from the sample use the same accounting method, that is, their accounts are comparable.

With respect to a particular sort of transaction or event surveyed, the H index has a maximum value of 1 when all firms use the same method (uniformity) and a minimum of 1/n when firms are proportioned evenly over *n* alternative methods. Therefore, H approaches 0 as the number of alternative methods, all with the same frequency, approaches infinity (Herrmann and Thomas, 1995, p. 256).

The H index is typically used to quantify national harmony (i.e, the harmony in a single country), but van der Tas (1988) pointed out that it can also be used to quantify international harmony (i.e., the harmony in several countries) by ignoring the country to which a firm belongs. For instance, harmony in the EU could be quantified using the H index by treating all firms in the sample as belonging to the same nation irrespective of their country of origin within the EU.

The H index, as the I index described further ahead, cannot comprise situations where the accounts of a firm are provided using more than one accounting method (multiple reporting), because they require each firm to be classified as using exactly one method. In view of this, to take account of multiple reporting, van der Tas (1988, pp. 167-168) proposed the C index which is given by the following expression:

$$C\ index = \frac{(\sum_{t=1}^{i} a_t{}^2) - n}{n^2 - n} \qquad (3\text{-}2)$$

where:

a*t* represents the number of firms applying accounting method *t*

i represents the number of alternative accounting methods

n represents the total number of firms

The C index is not a concentration index, although a mathematical relationship exists between the C index and the H index (van der Tas, 1988, p. 167). C equals the probability that two firms randomly selected from the sample (without replacement) have accounts that are comparable, being that C can also be interpreted as a model of inter-firm comparison (Archer *et al.*, 1995, p. 92), as it is obtained by dividing the pairwise comparisons between firms using the same method by the total number of possible comparisons.

Finally, to measure the level of international harmony, van der Tas suggested the I index. Considering only two countries, the formula presented by van der Tas (1988, p. 165), is as follows:

$$I\ index = \sum_{i=1}^{n} (fi^1\ x\ fi^2) \tag{3-3}$$

where:

fi^1 represents the relative frequency of method *i* in country *1*

fi^2 represents the relative frequency of method *i* in country *2*

n represents the number of alternative accounting methods

The I index for two countries equals the probability that two randomly selected firms (one from each country) use the same accounting method. Although this definition of the I index is similar to the definition of the H index, it is not equivalent. In fact, by requiring the two firms being compared to come from different countries, the I index emphasizes the level of harmony between countries at the expense of the level of harmony within countries. As pointed out by Taplin (2004), while the I index ensures that each country is given equal weight because it requires one firm to be selected from each country, the H index is likely to select both firms from the same country if that country has a much larger number of firms in the sample.

Van der Tas applied the I index for two countries and suggested in an appendix (van der Tas, 1988, p. 168) that it could be generalized to more than two countries in the following way:

$$I\ index = \left[\sum_{i=1}^{n} (fi^1\ x\ fi^2\ x \ldots x\ fi^m)\right]^{1/(m-1)} \tag{3-4}$$

where:

fi^m represents the relative frequency of method *i* in country *m*

m represents the number of countries

n represents the number of alternative accounting methods

In this formulation, the I index is computed by multiplying, across countries, the proportion of firms practicing a particular accounting alternative and then summing over all alternative practices. So, when there are more than two countries, the equation

consists in the product of *m* terms, and the I index equals the m-1st root of the probability that *m* randomly selected firms (one from each of the *m* countries) all use the same accounting method. This differs from the H index, since it is not required a pair of firms to have comparable accounts but *m* firms to have comparable accounts.

As the probability that a larger number of firms use the same accounting method is likely to be lower than only two firms use the same method, van der Tas (1988) suggested the exponent 1/(m-1) in the definition of the index, to correct this tendency. But, by doing so, the simplicity and interpretability of the I index is lost in the generalization to more than two countries, as the m-1st root of a probability is not as easily interpreted as a probability (Taplin, 2004, p. 59). Moreover, the similarity with the H index is reduced.

Since the pioneer work of van der Tas (1988, 1992a, 1992b) several proposals had emerged in the literature to refine this methodology or outline alternatives. The main contributions, which are presented below, aim to solve the need for:

- Improvements on measures of accounting harmony (discussed in section 3.2.2.)
- Statistical tests of significance on value variations of indices (discussed in section 3.2.3.).

3.2.2. Improvements on measures of accounting harmony

As the use of indices to quantify states of harmony became widespread in accounting research, several authors have suggested modifications to the basic H, C, and I indices provided by van der Tas (1988). Detailed reviews of international accounting harmonization literature can be found in, amongst others, Ali (2005), Taplin (2003, 2004), and Baker and Barbu (2007). I present below a summary of the main contributions which are primarily concerned with:

(a) Treatment of non-disclosure.
(b) More accurate specifications of traditional measures of harmony.
(c) New indices proposed by Taplin (2004, 2011).

a) Improvements related to the treatment of non-disclosure

It is difficult to assess the comparability of the accounts of a firm that does not state the accounting method used for a policy choice, especially if it is unknown whether the policy choice is not applicable or whether an accounting method was applied but not disclosed. When the policy choice is not applicable to a firm, it is plausible to consider its accounts comparable with the accounts of all other firms. Otherwise, when the policy choice is applicable but it is not known which accounting method was applied, comparability may be reduced. In view of this, treatment of non-disclosure has been discussed by numerous authors, including Archer *et al*. (1995), Morris and Parker (1998), Pierce and Weetman (2000, 2002), Aisbitt (2001), and Taplin (2004, 2010, 2011).

Archer *et al*. (1995) suggest three alternative ways to treat non-disclosure cases: (i) they can be omitted from the analysis; (ii) they can be treated as not applicable; (iii) or they can be treated as if the item exists but is not disclosed. Besides, the authors also advocate that sometimes (iv) a default assumption may be made if non-disclosers can be assumed to use a particular method, such as one required by an accounting standard. In this particular case, non-disclosers can simply be added to firms disclosing that they use the default method.

In order to avoid miscalculation of harmony by simply (i) omitting non-disclosures from the calculations, Archer *et al*. (1995) suggest adjustments to the C index. When non-disclosure is (ii) regarded as not applicable, it means that each non-disclosing firm is comparable with all other non-disclosers and with every disclosing firm, for the item in question. Hence, Archer *et al*. (1995) proposed the calculation of a "disclosure-adjusted C index" that recognizes this "universal comparability of not-applicable observations". In this case, the formula has a denominator that allows for the number of potentially comparable pairs, and a numerator that assumes universal comparability[3]. In

[3] As advanced by Archer *et al*. (1995, p. 72), whereas van der Tas' (1988) C index equals {Pairwise comparisons between companies using same method}÷{ Maximum pairwise comparisons between companies disclosing method}, the "disclosure-adjusted C index" equals {Pairwise comparisons between companies using same method (including the default method) plus pairwise comparisons with and between companies which did not include the item in their financial statements}÷{ Maximum pairwise comparisons between all companies (including all disclosers and non-disclosers)}.

contrast, when (iii) the item exists but is not disclosed, the denominator, but not the numerator, of the C index should be adjusted for non-disclosures.

Archer *et al*. (1995) define, but did not provide, a general formula for the disclosure-adjusted C index. Later, Morris and Parker (1998) set out an adjusted index, which they call the "raw" C index, for applicable cases that are not disclosed. In the "raw" C index the denominator allows for the number of potentially comparable pairs but the numerator assumes that non-disclosures are not comparable with any of the disclosed cases. In a simulation study, Morris and Parker (1998) illustrate that the "disclosure-adjusted" C index will usually produce higher scores, and the "raw" C index lower scores, than the C index calculated by omitting non-disclosures entirely. Building on prior research, Morris and Parker (1998) also extend to the I index the adjustment rules proposed by Archer *et al*. (1995), suggest a rule for adjusting the H index for non-disclosure cases, and indicate its relationship to van der Tas's (1988) C index. In addition, the authors show that, due to their statistical properties, between-country C index is preferable to the I index when a non-disclosure adjusted index is required.

Later, Aisbitt (2001) conducted a survey that sought to examine the usefulness of Archer *et al*.'s (1995) modified C index. However, given the sample, the author rejects the calculation of non-disclosure adjusted indices. Regarding to the non-disclosure of an accounting policy choice, Aisbitt (2001) remarks that (unlike some research assuming that the lack of information may be interpreted as corresponding to the use of the policy required by regulations) it was not possible to make a default assumption without risking distortion of the results. As regards the non-disclosure of an item in the annex, the author argues that it was clear in most reports that the item was applicable, but the firm had chosen not to make such disclosure. Therefore, Aisbitt (2001) concludes that adjusted indices would have presented a score higher than the true level of harmony.

Differently, Pierce and Weetman (2002) develop further the works of Archer *et al*. (1995), and Morris and Parker (1998) by applying a generalized formula for the between-country C index, in which non-disclosure is a mix of applicable and not-applicable cases. The authors conclude that harmony is better estimated when the data is analyzed to distinguish applicable from not-applicable cases of non-disclosure, and the formulae applied are adjusted appropriately in both the numerator and denominator.

More recently, Taplin (2004, 2011) introduce (within the framework of the T index described further ahead) the treatment of non-disclosure as an accounting method encompassing all the four assumptions discussed in previous literature:

(i) Not applicable (firms that do not disclose are removed from the sample) - this option may be appropriate when it is intended to measure the level of harmony only for firms for which this particular accounting policy is an issue.

(ii) Comparable to everything - this option may be appropriate when assuming that non-disclosure results from non-applicability, and therefore the accounts of a non-disclosing firm are comparable with the accounts of any other firm.

(iii) Comparable to nothing - this option may be appropriate if firms fail to disclose their accounting policy choice in order to withhold information and make comparisons between accounts difficult, rather than because it was not applicable.

(iv) Comparable to the standard (or default) method - this option may be appropriate if non-disclosure implies that the accounting method used is a standard or default method required by regulation and it is reasonable to assume that the method used was not disclosed because it is understood that default was applied.

Moreover, the author advocates that, when it is difficult to conclude why firms do not disclose their accounting method, it may be beneficial to report and compare values of the harmony index calculated under several options.

b) Improvements related to the specification of measurement techniques

In general, developments in the formulation of indices aim to provide more accurate measures of harmony, and, in particular, to solve some flaws in previous specifications of the C and I indices.

Regarding to the I index, a severe limitation pointed out in related literature is due to its sensitivity to nil proportions. As mentioned before, the I index is computed by multiplying, across countries, the proportion of firms practicing a particular accounting alternative (see pp. 43-44). Hence, when the number of countries exceeds two, the practices of one or more of the countries can, in extreme cases, render the score of the I

index totally meaningless. To illustrate this drawback, Emenyonu and Gray (1996, p. 274) present an example consisting of four countries and two accounting methods being their relative frequencies as follows (%):

Country	**1**	**2**	**3**	**4**
Accounting method 1	1,0	1,0	0,0	1,0
Accounting method 2	0,0	0,0	1,0	0,0

Accordingly, I index = $(1,0 \times 1,0 \times 0,0 \times 1,0 + 0,0 \times 0,0 \times 1,0 \times 0,0)^{1/(4-1)} = 0,0^{1/3} = 0$

Therefore, despite all the firms in three countries (1, 2, 4) apply the same accounting method, the I index equals zero erroneously suggesting that there is no degree of harmony among the four countries, being that this misleading result arrives from the fact that all firms from country 3 adopt the accounting method 2 which is not in use by any of the firms in the other three countries.

Van der Tas's (1988) formulation of the I index for more than two countries was also criticized by Archer and McLeay (1995) on the grounds that the exponent correction factor l/(m-l) is not consistent with the I index being an analogue of the H index[4]. To ensure that the I index is an equivalent of the H index, Archer and McLeay (1995) suggest a modified I index when examining more than two countries. However, their version also suffers from sensitivity to zero frequencies, and it "…is not particularly useful because it lacks simplicity…" (Taplin, 2004, p. 60).

To control for this sensitivity Herrmann and Thomas (1995) employed a modification to the I index, by recording as 0,99 the proportion for the unanimous method and as 0,01 the proportion for the non-practiced method (instead of 1 and 0, respectively), in cases where all firms in a particular country chose one of the two available methods. Otherwise, facing the same problem, when the number of countries exceeds two and a zero frequency is observed, Emenyonu and Gray (1996) decided not to compute the score of the I index for that particular topic.

[4] Archer and McLeay (1995) pointed out that the exponent l/(m-l) does not equal 2 (the exponent in the H index), and is applied to the sum of cross products and not to individual cross products for each accounting method.

With regard to the C index, Archer *et al*. (1995) documented the possibility to decompose this measure in a way that allows distinguishing comparability within countries (intra-national) from comparability between countries (inter-national). For this purpose, Archer *et al*. (1995) divided the C Index into the within-country and between-country components, and, unlike van der Tas (1988), were able to use only one index to measure harmony both at national and international level. Taplin (2004) describes the within-country C index as the probability that two firms selected randomly (without replacement) have accounts that are comparable if the two firms are selected such that they must belong to the same country, whereas the between-country C index represents the probability that two firms selected randomly (without replacement) have accounts that are comparable if the two firms are selected such that they must not belong to the same country.

Krisement (1997) criticized van der Tas's (1988) C index on the grounds that it is affected by the number of observations and Archer *et al*.'s (1995) model because the within-country and between-country components do not sum to the total value of the global C index. Instead of this index, to measure comparability of financial reporting Krisement (1997) suggested the coefficient of entropy as the only concentration index to be additively decomposable[5]. However, entropy has a caveat as it fails at the occurrence of multiple reporting. So, Krisement (1997) proposed a combination of the coefficient of entropy and the C index (suited to deal with multiple reporting) to measure the degree of comparability where the accounts of a firm are provided using more than one accounting method.

Another modification to van der Tas's (1988) C index, motivated by the dependence of this index on the number of accounting methods or on the number of firms analyzed, was proposed by Lainez *et al*. (1999). The authors introduced a new indicator, which they call the "CJL index", resulting from the modification of the C index for the purpose of eliminating the bias arising from its use for cases in which the number of accounting alternatives considered differs from the number of firms for which the study

[5] The properties of five concentration indices: Herfindal index, Entropy, *k*-firm concentration ratio, Hannah and Kay index, and variance of logarithms, were discussed by Curry and George (1983) based on prior research by Hall and Tideman (1967), and Hannah and Kay (1977).

of the practice in question is meaningful[6]. To evaluate comparability over time and between different accounting practices, the authors calculate the "real level of minimum uniformity", based on the firms for which each one of the practices analyzed was actually applicable, and subsequently transferred it to a common scale from 0 to 1.

Along with the above mentioned modifications to the basic indices proposed by van der Tas (1988), other tools to measure accounting harmonization also appeared in related literature, namely the use of statistical methods. However, these approaches are not equivalent to the use of indices, as they are intended to measure different concepts of harmonization, as discussed below.

To capture the extent to which changes in harmony could be attributed to efforts towards *international harmonization* or *national standardization*, Archer *et al*. (1996) provided a methodology based on a hierarchy of nested statistical models used to describe accounting policy choices made by firms. In order to modeling the harmonization process, the authors express harmony in a way that identifies departures from "equiprobable accounting policy choice". This notion is based on the concept of "distributional harmony" in which, other things being equal, the expected distribution of accounting policy choices is the same in each country. According to Archer *et al*. (1996), *international harmonization* occurs when the distributions of firms across accounting methods in two or more countries become aligned over time, and *domestic standardization* occurs when the distribution of accounting methods across firms changes over time so that the absolute frequency of one accounting method significantly increases. These concepts differ from previous research, but Archer *et al.* (1996) reconcile their results with the indices of van der Tas (1988) and Archer *et al*. (1995).

McLeay *et al*. (1999), and Jaafar and McLeay (2007) developed the methodology conducted earlier by Archer *et al*. (1996) based on nested hierarchy of general linear models, to carry out an analysis of standardization and harmonization in reporting practices. Again, their technique is not similar to the use of indices, since the two methods rely on different concepts of harmonization. In particular, the model of

[6] This bias arises from the dependency of the value of the C index on the number of existing alternatives and the number of firms analyzed. That is, the C index only reaches the minimum value of zero when each one of the firms adopts a different method and the number of accounting alternatives is equal to the number of firms analyzed, which is a very unlikely situation to occur (Lainez *et al*., 1999, pp. 97-98).

McLeay *et al*. (1999) provide a measure of harmony for which the comparability would depend on the use of accounting methods appropriate to a firm's circumstances and not on the use of the same method by all firms. In the same vein, for Jaafar and McLeay (2007) full harmony occurs when *similar* firms are comparable.

Another tool applied to assess harmony is the chi-square statistic (Emenyonu and Gray, 1992, 1996; García Benau, 1994; Herrmann and Thomas, 1995; Emenyonu and Adhikari, 1998; Parker and Morris, 2001; Ali, 2005, 2006; Baker and Barbu, 2007). By comparing observed frequencies against expected frequencies, the chi-square statistic tests for the equality of the proportions of accounting policy choices across groups (generally countries). Notwithstanding, although the chi-square test of independence has been used as an alternative to indices, related literature distinguishes between these two techniques.

Using harmony indices implies a notion of harmonization as the extent of concentration around a particular accounting policy choice. Therefore, the level of harmonization increases as the number of firms selecting the same accounting policy increases, and the maximum harmony is reached when all the firms select the same accounting policy (or give information enough to reconcile).

Using the chi-square test implies a notion of harmonization as the extent to which the preferences of some independent groups are matched. Therefore, harmonization is achieved when the firms in each group (e.g., country) select accounting policies with the same frequency.

So, for some time the chi-square test was considered suitable to assess the level of harmony between countries while indices were considered more appropriate to measure national harmony as the concentration of firms on one or some accounting alternatives (Herrmann and Thomas, 1995). However, the results from the chi-square tests should not always be expected to be consistent with the rankings given by the I index computations (Emenyonu and Adhikari, 1998; Taplin, 2003).

As described by Taplin (2003, p. 91) the chi-square test may not be accurate for comparing the level of international harmony, namely when the level of harmony is

similar within countries, but the choice of method is significantly different between countries. Moreover, potential difficulties with chi-square test may arise due to the requirement of at least one specific cell frequency[7] and to the sensitivity to sample size. For instance, "even if the distributions over accounting methods are held constant (…) the chi-square statistic will be higher with higher sample sizes and statistically insignificant in sufficiently small sample sizes. The harmony indices are not dependent on sample size in this way. They are also valid with small cell frequencies." (Taplin, 2006, pp. 7-8).

c) Recent developments – the T and R indices

Taplin (2004) argues that indices are superior to other measurement techniques and develops further prior research by providing a unified approach to measure international accounting harmony, which the author calls the "T index".

The T index comprises most of the previous indices, either directly or by retaining their desirable properties, and allows the researcher to form a specific index with the required characteristics, without sacrificing one desirable property in order to reach another desirable property. The flexibility in the T index comes from the possibility to specify which accounting methods are comparable, and the probability that the firms should be selected from a given pair of countries. This is achieved by specifying two coefficients:

- αkl for the comparability between accounting method k and accounting method l
- βij for the comparability between firms in countries i and j

The general formula for the T index presented by Taplin (2004, p. 61) is as follows:

$$T\ index = \sum_{i=1}^{N}\sum_{j=1}^{N}\sum_{k=1}^{M}\sum_{l=1}^{M} \alpha_{kl}\beta_{ij}\rho_{ki}\rho_{lj} \qquad (3\text{-}5)$$

where:

αkl is the coefficient of comparability between accounting methods k and l

[7] Cochran (1952) suggests that at least 20 per cent of the alternatives must have a frequency of 5 and none less than 1. In case it does not happen some of the alternatives must be put together as being just one in order to comply with the requirement. In view of this, Taplin (2006) argues that categories are likely to be combined for statistical convenience rather than combined for accounting reasons.

β_{ij} is the weighting for the comparison between firms in countries *i* and *j*
ρ_{ki} is the proportion of firms in country *i* that use accounting method *k*
ρ_{lj} is the proportion of firms in country *j* that use accounting method *l*
N is the number of countries (labeled *1* to *N*)
M is the number of accounting methods (labeled *1* to *M*)

The T index equals the probability that two firms randomly selected (with replacement) have accounts that are comparable. In order to ensure that T ranges from 0 (complete disharmony) to 1 (complete harmony) is required the α_{kl} and the β_{ij} to be between 0 and 1, and that the β_{ij} sum to 1. The product $\rho_{ki}\ \rho_{lj}$ is similar to the product $f_i^1 f_i^2$ in the definition of the basic I index for two countries (see p. 43). The difference is that now the T index considers any two countries *i* and *j* from a sample of *N* countries, including the possibility that these countries *i* and *j* are the same country.

According to the formulation created by Taplin (2004), T corresponds to a weighted average of the two-country I index. This arrangement, unlike the formulae of the I index proposed by van der Tas (1988) and Archer and McLeay (1995), allows the generalization to more than two countries without a correction factor in the exponent and without suffering from sensitivity to zero proportions.

Based on prior literature, Taplin (2004) identified the main criteria to arrive at a specific index within this framework:

1) The weighting given to firms or countries.
2) The international focus: within country; between country; or overall.
3) The treatment of multiple accounting policies.
4) The treatment of non-disclosure.

The first two criteria (1 and 2) determine the coefficient β_{ij}, and the last two criteria (3 and 4) determine the coefficient α_{kl}.

The aim of coefficient α_{kl} is to recognize the different impacts on comparability when a pair of firms adopts distinct accounting methods with a higher or lower level of dissimilarity. It should be noted that, in this framework, alternative accounting methods include accounting methods created for multiple reporting and for non-disclosure.

Besides, since the accounting method *k* does not have to be the same as accounting method *l*, the T index considers the possibility that two different accounting methods may be comparable. Moreover, it is possible to consider fractional comparability between two accounting methods, with αkl assuming a value on the continuum from 0 (completely incomparable) to 1 (completely comparable).

As shown in the next table, the options for the T index when estimating αkl comprises three treatments of multiple accounting policies (under criterion 3) combined with four ways of dealing with non-disclosure (under criterion 4).

Table 3-1: Options for the T index when estimating αkl

Criteria to estimate the coefficient of comparability between accounting methods k and l - αkl		
3) Multiple accounting policies	3a	Multiple accounting policies are not allowed $\alpha kl = 0$ if k≠l
	3b	Multiple accounting policies are allowed if completely comparable $\alpha kl = 1$ when methods k and l are complete comparable $\alpha kl = 0$ when methods k and l are complete incomparable
	3c	Multiple accounting policies are allowable with fractional comparability αkl takes a value on the continuum from 0 (completely incomparable) to 1 (complete comparable)
4) Non-disclosure	4a	Not applicable Firms who do not disclose a method are removed from the sample
	4b	Comparable to everything $\alpha_{KM} = \alpha_{Ml} = \alpha_{MM} = 1$ for all accounting methods K and l
	4c	Comparable to nothing $\alpha_{KM} = \alpha_{Ml} = \alpha_{MM} = 0$ for all accounting methods K and l
	4d	Comparable to the standard (or default) method S $\alpha_{KS} = \alpha_{KM}$, $\alpha_{Sl} = \alpha_{Ml}$ for all K and l

Source: Taplin (2004, pp. 65-66)

With regard to the coefficient βij, the aim is to give distinct weights for comparisons between firms belonging to two different countries. For instance, different weights may be given to countries in order to absorb the impact of the sample size or the population size. As shown in Table 3-2, the options for the T index when estimating βij comprises three weighting schemes to be given to firms or countries (under criterion 1) combined with three types of international focus (under criterion 2).

Since the options under these four criteria (1, 2, 3, 4) can be chosen independently, the T index allows numerous choices for the coefficients αkl and βij, being that such range of combinations was not possible using prior indices.

Table 3-2: Options for the T index when estimating βij

Criteria to estimate the coefficient of comparability between firms in countries i and j - βij		
1) Firm/country weightings	1a	Firms are weighted equally (each firm receives weight proportional to the number of firms sampled from that country) $bi = ni/n$ where: ni = the number of firms from country i in the sample n = the total number of firms in the sample bi = the proportion of firms in the sample from country i
	1b	Countries are weighted equally $bi = 1/N$ where: N = the number of countries
	1c	Countries are weighted according to the total population number of firms in each country $bi = ui/\sum_{i=1}^{N} ui$ where: ui = the total number of firms in country i (for instance, the total number of firms listed on the stock exchange rather than the number of firms in the sample)
2) International focus	2a	Overall $\beta ij = bibj$
	2b	Within country $\beta ii = bi^2/\sum_{i=1}^{N} bi^2$ if i=j $\beta ij = 0$ if i≠j
	2c	Between country $\beta ii = 0$ if i=j $\beta ij = bibj/\sum_{i=1}^{N}\sum_{j\neq i} bibj$ if i≠j where the summation for j is over all countries 1 to N except for country i

Source: Taplin (2004, pp. 64-65)

Later, in order to address formally international comparability Taplin (2011) defined one more index, which the author named as "R index". R is a ratio of indices, calculated under the T index framework, and it is obtained by dividing the between-country index by the within-country index. Accordingly:

- When R equals 0, the between-country index must equals 0 and there is total disharmony between countries.
- When R equals 1, the between-country and within-country indices are equal, so the level of harmony between countries is fully explained by the level of harmony within countries. This occurs when the distribution of accounting methods is the same for each country, matching the notion of harmony advocated by Archer *et al*. (1996), and McLeay *et al*. (1999).
- When R is greater than 0 but smaller than 1, the index score can be interpreted as

the percentage of comparability of firms from different countries, in relation to its maximum possible value, given the extent to which firms within the same country are comparable.

The formulation developed by Taplin (2004, 2011) seems the most appropriate to measure comparability of accounts (Cole *et al*., 2009; Mustata *et al*., 2011), as it brings together all of the desirable properties of previous indices and solves the flaws of the C and I indices presented earlier. In view of this, the present investigation adopts the technique proposed by Taplin (2004), whose flexibility allows designing a set of indices suitable to measure disclosure harmony on GHG emission allowances in annual accounts, as described in chapter 6.

3.2.3. Statistical tests of significance

Despite the above mentioned difficulties associated to the use of the basic H, C and I indices, Tay and Parker (1990, 1992) considered this methodology useful. The score of the index can be interpreted as a measure of accounting harmony (a state), while the change in the value of the index over time can be regarded as a measure of accounting harmonization (a process). They noted, however, that no statistical tests had been devised to evaluate statistical significance of value variations of indices. To overcome this gap, Tay and Parker (1990, p. 85) suggest the use of "some appropriate significance test, for example, chi-square".

Since then, several studies used the chi-square test either to assess statistical significance of value variations of indices or to measure harmony (Emenyonu and Gray, 1992, 1996; García Benau, 1994; Herrmann and Thomas, 1995; Emenyonu and Adhikari, 1998; Parker and Morris, 2001; Ali 2006).

As discussed in previous section, although the chi-square test has been used in some research to measure harmony it is not equivalent to the use of indices, because these two techniques rely on different notions of harmonization. Regarding to the use of the chi-square test to evaluate how trivial or statistically significant variations in index values are, some limitations are underlined by, amongst others, Cañibano and Mora (2000, p. 359). One of the assumptions to apply the chi-square test is the independence

between the groups, that is to say between the same sample of firms in different periods. This assumption implies accepting that the probability of a firm to select one accounting alternative in the following period is independent from its selection in the previous period. However, it is not a reasonable statement, since firms cannot easily shift from one accounting method to another every year.

To overcome these difficulties, in addition to using the chi-square test, Cañibano and Mora (2000) also carried out a bootstrapping procedure to analyze if the change of the harmony index between two periods was statistically significant, and hence to conclude whether there was, or not, a process of harmonization. The bootstrapping procedure is a technique introduced by Efron (1979) for estimating the distribution of an estimator or test statistic by resampling original data set. The process is done by sampling with replacement to get samples of the same size in order to gather alternative versions of the single statistic that ordinarily would be calculated from just one sample[8].

The null hypothesis, tested by Cañibano and Mora (2000), was that the observed change in the value of the index was not different from the changes obtained with a randomly generated distribution. If the observed change was unlikely to come from the generated distribution, the initial assumption would be rejected. In Cañibano and Mora (2000) the distribution was generated by 1 000 interactions, where the accounting choices were randomly allocated using the binomial distribution. The C index was calculated for each of the 1 000 interactions, and 999 changes in the index were subsequently derived. The observed change in the index was then compared with this generated distribution, being that the probability of the observed change not being greater than zero was given by the rank of the observed change when contrasted with the generated distribution. In their study, Cañibano and Mora (2000, p. 365) consider "that a difference which is between the first ten differences of 1 000 could be regarded as a significant change in the value of the index, and not a random difference". However, as pointed out by the authors, there is not a statistical rule to determine the limits to consider an outcome as significant.

[8] It should be noted that the number of bootstrap samples recommended has increased, as available computing power has increased, but related literature does not specify a strict rule on this matter, being that increasing the number of samples does not increase the amount of information in the original data, it can only reduce the effects of random sampling errors. Actually, bootstrap does not apply to small data sets where the original sample is not a good representation of the population.

Therefore, the need for statistical significance tests for value variations of indices remained a problem. To fill this gap, Taplin (2003) provided formulae for the standard error of the H index and the C index[9]. The author argues that by presenting not only the value of the index itself but also its standard error the problem should be solved as the differences between index values can be judged as being either significantly different or explainable by sampling variation alone. Beside, Taplin (2003, p. 83) adds that this procedure "avoid the necessity to perform computer intensive bootstrapping such as those adopted by Cañibano and Mora (2000)". However, the methodology proposed by Taplin (2003) did not have widespread acceptance in empirical research. One possible reason is precisely the potentially large number of calculations involved. For instance, considering a sample of 8 countries and 5 accounting methods, the number of terms for the calculation of the covariances could amount to 8^4 x 5^4, that is 2 560 000 (Taplin, 2010, p. 95).

Later, Taplin (2010) also provided the formula for the standard error of the T index he had created before (Taplin, 2004). In Cairns *et al*. (2011) (a research conducted by Cairns, Massoudi, Taplin, and Tarca), the T index was adopted to measure harmony, the standard errors were computed to provide an assessment of how accurately the T indices have been estimated, and p-values were computed to summarize the evidence of a change in harmony from one year to another, being that these p-values were estimated from 10 000 bootstrap samples.

Meanwhile, regarding to statistical inference, other tools were adopted by, amongst others, Murphy (2000), Aisbitt (2001), and Pierce and Weetman (2002).

Murphy (2000) applied the H index to measure harmony and the Spearman correlation coefficient to identify a trend. This statistic may be used to test for trend between a bivariate sample of (Xi,Yi) pairs. In Murphy's (2000) study, Xi is the fiscal year-end and Yi is the H index. The hypothesis 1 was formulated as follows: "There is no association between the year and the level harmony, as measured by the H index, for the 8-year period 1988-1995". This hypothesis was tested using the Spearman correlation

[9] In the same study, Taplin (2003) shows that while H and C indices are biased, the bias of the H index is negligible in moderate to large samples and the bias of the C index is negligible in moderate to large populations.

coefficient, being that the rejection of hypothesis 1 would imply that the level of harmony between firms has changed. An increasing trend would indicate that harmonization occurred. A decreasing trend would indicate disharmonization (i.e., movement toward total diversity).

Aisbitt (2001) used Archer *et al.*'s (1995) decomposed C index to measure states of harmony and applied the Wilcoxon signed ranks test to evaluate whether the changes in states of harmony (index scores) were significant for a 8-year period. First, the test was conducted to evaluate changes in median values of the indices. Then, in order to explore the reasons behind the observed lack of harmonization, the author examined the changes in values of indices on an item-by-item basis.

Pierce and Weetman (2002) used Archer *et al.*'s (1995) between-country C index and a "generalized non-disclosure adjusted" between-country C index in which non-disclosure is a mix of applicable and not-applicable cases. Tests of differences in means and medians were conducted using one-way ANOVA and Mann-Whitney tests. Additionally, in order to evaluate direction and progress of the harmonization process, ordinary least square regression is used to estimate the slope of the trend line of the levels of harmony (index scores) over a 8-year period. A positive slope would indicate that harmonization occurred, and a negative slope would indicate disharmonization.

Actually, the use of regression analysis to evaluate harmonization trends was suggested earlier by van der Tas (1992b). However, its application has been rather limited since then, probably because vast majority of empirical studies examines harmony of accounting practices only in a single year or in two different points in time. Otherwise, the present investigation fully covers an eight-year period, what allows conducting regression analysis to test jointly trends on harmonization and differences in the level of harmony between the various groups of firms in the sample, as described in chapter 6.

Next table summarizes the main contributions on the operationalization of the concept of *de facto* (material) accounting harmonization in related literature, as discussed in this chapter.

Table 3-3: Operationalization of the concept of *de facto* accounting harmonization

Author (s)	Measurement of *de facto* accounting harmonization - main contributions
Van der Tas (1988)	Introduction of the H, C, and I indices to quantify harmony.
Tay and Parker (1990, 1992)	Discussion of the need for statistical tests, such as the chi-square test, to evaluate statistical significance of value variations of indices.
Van der Tas (1992a,1992b)	Discussion of the need for statistical test to evaluate value variations of indices. Suggestion of statistical significance tests or regression analysis to test movements on the C index.
Emenyonu and Gray (1992, 1996) García Benau (1994) Herrmann and Tommas (1995) Parker and Morris (2001) Ali (2006)	Use of chi-square test either as a measure of harmony or a statistical test of significance of value variations of indices.
Herrmann and Thomas (1995)	Proposal of a modified I index for more than two countries in order to reduce a flaw of the I index when some countries have no sampled firms using an accounting method.
Archer and McLeay (1995)	Introduction of a new formula for the I index for more than two countries that is an analogue of the H index, although suffering from sensitivity to zero frequencies like the generalization provided earlier by van der Tas (1988).
Archer, Delvaille and McLeay (1995)	Decomposition of the overall C index into a between-country C (BCC) index and a within-country C (WCC) index to emphasize comparisons in different countries or in the same country, respectively.
Archer, Delvaille and McLeay (1995) Morris and Parker (1998) Aisbitt (2001) Pierce and Weetman (2000, 2002)	Discussion of possible treatments of non-disclosure when applying harmony indices. Proposals of new indices or modifications of the existing indices to allow for non-disclosure in an appropriate way.
Archer, Delvaille and McLeay (1996)	Use of a new methodology based on a hierarchy of nested statistical models to describe accounting policy choices made by firms. Reconciliation of results with the indices of van der Tas (1988) and Archer *et al*. (1995).
Emenyonu and Gray (1996)	Discussion of the I index sensitivity to zero frequencies suggesting not to compute the index when the number of countries exceeds two and a zero frequency is observed for a particular item.
Krisement (1997)	Critic of van der Tas's (1988) C index sensitivity to the number of observations and to Archer *et al*.'s (1995) C index due to the BCC and WCC components not sum to the total value of the global C index. Use of the coefficient of entropy (CE) as the only concentration index to be additively decomposable. Use of a combination of the CE and the C index, where there are multiple reporting.
McLeay, Neal and Tollington (1999) Jaafar and McLeay (2007)	Development of the methodology based on a hierarchy of nested statistical models proposed earlier by Archer *et al*. (1996).
Lainez, Jarne and Callao (1999)	Critic of van der Tas's (1988) C index due to its dependence on the number of observations or on the number of accounting alternatives. Introduction of a modified C index, called CJL index, for the purpose of eliminating the bias arising from its use when the number of alternatives differs from the number of firms.
Cañibano and Mora (2000)	Use of bootstrapping procedure to evaluate statistical significance of changes in states of harmony (index scores) between two periods.
Murphy (2000)	Use of Spearman correlation coefficient to identify the direction and progress (the trend) of the harmonization process for a 8-year period.
Aisbitt (2001)	Use of Wilcoxon signed ranked test to evaluate whether the changes in states of harmony (index scores) were significant for a 8-year period.
Pierce and Weetman (2002)	Use of OLS regression to estimate the slope of the trend line of the levels of harmony (C index scores) for a 8-year period, in order to evaluate direction and progress of the harmonization process.
Taplin (2003)	Deduction of the formulae for the bias and standard error of the H and C indices.
Taplin (2004)	Introduction of a new index, called the T index, which provided a unified approach to most of previous indices, retaining their desirable properties and allowing to solve the flaws of the C and I indices presented earlier.
Taplin (2010)	Deduction of the formulae for the bias and standard error of the T index.
Taplin (2011)	Definition of a new index, called the R index, in order to address formally international comparability within the T index framework.

4. Theoretical background and previous empirical evidence on *de facto* accounting harmonization and environmental disclosure

This chapter presents theoretical and empirical frameworks to examine de facto accounting harmonization in response to regulatory requirements or due to voluntary processes, and to identify the drivers of both mandatory and voluntary environmental disclosure.

4.1. Theoretical background of *de facto* accounting harmonization

The harmonization of financial reporting is a recurrent theme in literature since the mid 60's of last century, but it was the creation of the IASC, in 1973, and the adoption of the Fourth Directive, in 1978, that triggered a special interest to the study of topics such as the feasibility of international accounting harmonization (e.g., Nair and Frank, 1981; Evans and Taylor, 1982; van der Tas, 1988, 1992b; Doupnik and Taylor, 1985; Emenyonu and Gray, 1992; Emenyonu, 1993; Yang and Lee, 1994), or the underlying reasons of divergent accounting practices across countries (e.g., Choi and Mueller, 1992; Belkaoui, 1995; Nobes and Parker, 1995; Nobes, 1998)[1].

Despite the progress in *de jure* (formal) harmonization, the diversity of practices persisted, and for two decades related literature identified a large number of possible explanations for those differences with no general theory linking the causes, as described by Nobes (1998, pp. 162-163). Authors such as Schweikart (1985) or Harrison and McKinnon (1986) provide some elements for a theoretical framework, without specifying which factors were the major explanatory variables for the diversity of international accounting practices. On this view, stranded on the cross-cultural work of Hofstede (1980, 1983), Gray (1988) developed hypotheses on the association between accounting sub-cultural values and Hofstede's cultural dimensions.

Gray (1988) posits that the accountants' value systems are related to, and derived from, the particular societal values in each country, and identified four accounting value dimensions that can be used to define a country's accounting sub-culture: (i) professionalism versus statutory control; (ii) uniformity versus conformity;

[1] Refer to Ali (2005), and Baker and Barbu (2007) for a detailed review of literature on international accounting harmonization.

(iii) conservatism versus optimism; and (iv) secrecy versus transparency. According to Gray (1998, p. 12), the first two dimensions relate to *authority* and *enforcement* of accounting systems, and the last two dimensions regard to the *measurement* and *disclosure* practices, at country-level.

Building on Hofstede-Gray framework, several authors (e.g., Eddie, 1990; Salter and Niswander, 1995; Gray and Vint, 1995; Zarzeski, 1996; Wingate, 1997; Jaggi and Low, 2000; Hope, 2003) conducted empirical tests to prove its validity[2], while others (e.g., Perera, 1989; Fechner and Kilgore, 1994; Baydoun and Willett, 1995), attempt to refine or to extend Gray's (1988) model, presenting economic and cultural factors as mediators in the relationship between accounting sub-culture and accounting practice.

In the same line, Doupnik and Salter (1995) synthesize the reasons identified in earlier literature as explanations for international accounting differences, and suggested a model with three interacting categories that determine national accounting practices: (i) cultural values (individualism, power distance, uncertainty avoidance, and masculinity); (ii) institutional structures (legal system, capital market, tax system, inflation, level of education, and level of economic development); and (iii) external environment.

Later, after examining previous literature, Nobes (1998) proposes a two-way classification model using two key factors: (i) the strength of equity markets; and (ii) the degree of cultural dominance. The underlying assumption is that the major reason for international differences in financial reporting is different purposes for that reporting in each country. According to Nobes (1998), the purpose of reporting is determined by the financial system of the country, and disclosure items are determined by the relative importance of *outsiders* (financiers who do not belong to the board of directors and do not have a privileged relationship with the firm) compared with *insiders*, being that in countries where *outsiders* are important, there is a demand for more disclosure.

The rationale is that, in countries with strong equity markets, national accounting systems are oriented to help investors predict future cash flows, and disclosure is, therefore, intended to meet the information needs of public ownership. In contrast, in credit based countries, where banks are the main fund providers, national accounting

[2] Refer to Finch (2009) for a review of empirical research on Hofstede-Gray framework.

systems are oriented to protect creditors' rights. Thus, the pressure for disclosure in these countries tends to be weaker than in countries with developed equity markets.

In summary, Nobes' (1998) model suggests that in *culturally self-sufficient* countries (with strong indigenous cultures) the predominant accounting system depends on the strength of the equity-outsider market, and in *culturally dominated* countries (with imported cultures), the accounting system is determined by the cultural influence.

However, it should be noted that this analytical framework was not focused on the categorization of countries but it was intended on the distinction of reporting practices used by firms (accounting practice systems). According to Nobes (1998, p. 184), as a country might exhibit the use of several accounting systems in any one year or over time, "…it is accounting practice systems, not countries, that should be classified".

Notwithstanding, all the above mentioned models (Gray, 1988; Fechner and Kilgore, 1994; Doupnik and Salter, 1995; Nobes, 1998) are designed in the light of *contingency theory* according to which the influence of cultural and institutional environments in which firms operate are decisive in determining their accounting disclosure practices[3].

Concurrently, literature on comparative law divided major legal systems in the world into two main types: Roman (code) law, and common law (e.g., David and Brierley, 1985). Based on this distinction, La Porta *et al*. (1997, 1998) established a connection between law and finance, demonstrating that the legal environment (encompassing legal rules and their enforcement) matters for the size and the extent of a country's capital market. In this regard, the authors find a statistical association between strong equity markets and common law countries, suggesting that code law countries have both the weaker investor protection and the least developed capital markets, when compared to common law countries.

Since then, building on the work of La Porta *et al*. (1997, 1998), empirical research provides strong evidence that country-level legal environment affects voluntary disclosure as well as other accounting choices (e.g., Ball *et al*., 2000; Jaggi and Low,

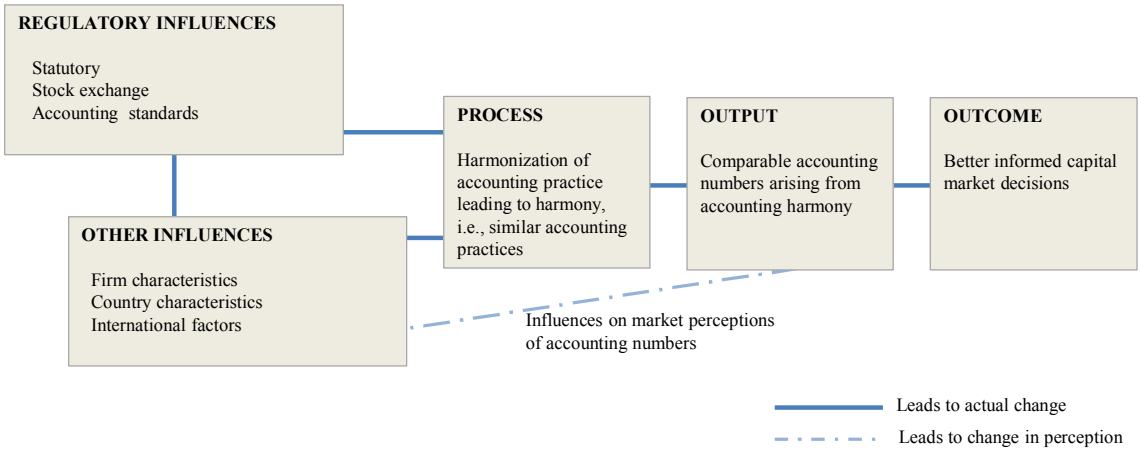
[3] The underlying notion, developed by Thomas (1991, pp. 40-41) as a *contingency theory of corporate financial reporting systems*, is that an enterprise is an open system that interacts with, adapts to and seeks to control its environment in order to survive, being the "management's choice of corporate financial reporting practices (...) contingent upon the differing constraints on entities".

2000; Hope, 2003; Leuz *et al*., 2003; Bushman *et al*., 2004; Bushman and Piotroski, 2006; La Porta *et al*., 2006; Webb *et al*., 2008).

On this subject, Jaggi and Low (2000) notice that firms in code law countries tend to make fewer disclosures, while Bushman and Piotroski (2006) find that bad news are reported faster in countries with higher quality legal systems (common law countries). Overall, empirical research points out a relationship between better financial reporting and common law countries, suggesting that international differences in accounting practice are likely to subsist, despite the progressive convergence between IFRS and US GAAP or the compulsory use of IFRS for consolidated financial statements in EU countries, since 2005 (Nobes, 2006, 2008; Kvaal and Nobes, 2010).

When synthetizing prior literature on international accounting harmonization, Rahman *et al*. (2002) outline accounting harmonization as a complex process, multi-faceted, dealing with four elements: *influences*, *process*, *output* and *outcome*, as shown in figure 4-1.

Figure 4-1: Determinants of international accounting harmonization



Source: Adapted from Rahman *et al*. (2002, p. 49)

Influences can be regulatory or not. *Regulatory influences* comprise harmonization of accounting regulations (statutory, stock exchange or accounting standards), while *other influences* comprehend firm characteristics, country characteristics, and international factors like trade, and investments agreements, international regulatory institutions, and colonial influences. The *process* refers to the accounting policies chosen by firms, the

output is the result, at one point in time, in terms of the level of accounting harmony, and the *outcome*, which is expected to be better informed capital markets decisions, is the consequence of accounting harmonization. The relationships between these four elements can flow in both directions, being that influences can affect practices but practices can also affect regulatory influences.

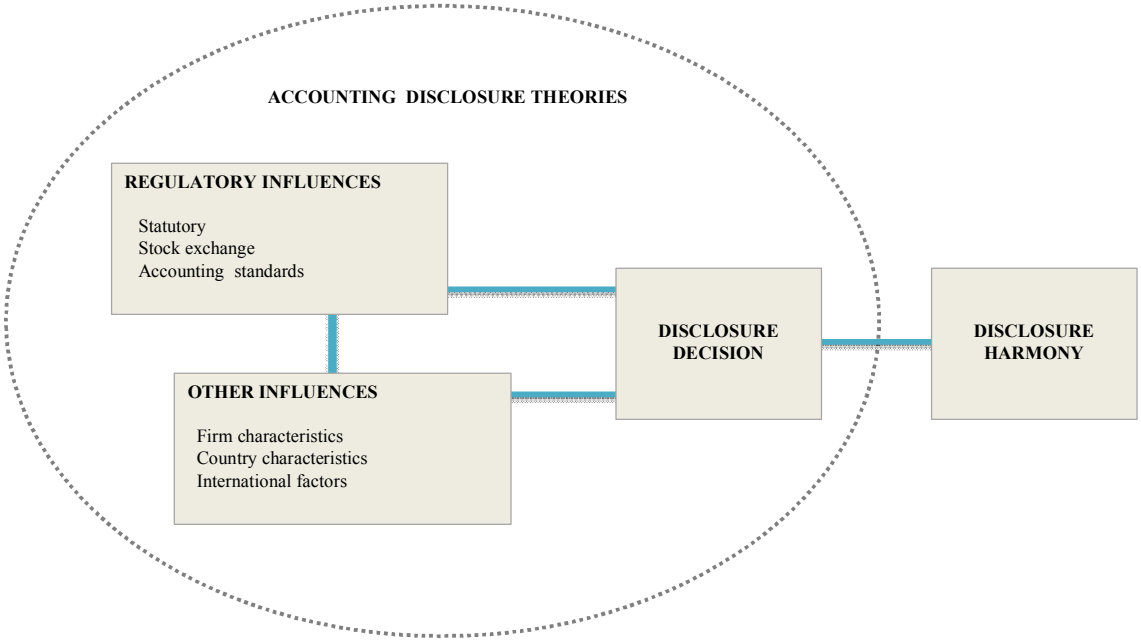
Against this background, the present study contributes to a better understanding of the determinants of international accounting harmonization in two ways.

The first is providing evidence on whether *de jure* (formal) harmonization leads to *de facto* (material) harmonization. The issuance of compulsory dispositions for firms linked to the Spanish allowances allocation plan is an opportunity research to evaluate the effect of *regulatory influences* over the harmony in disclosure practices (the *output*).

The second consists in shedding some light on the assumption that the internationalization of firms may be a driver of voluntary harmonization (Cañibano and Mora, 2000; Khanna *et al*., 2004; Webb *et al*., 2008). On this regard, research design is meant to evaluate the effect of *firm-specific characteristics*, such as the level of exposure to international markets, over the harmony in disclosure practices (the *output*), especially in the context of no mandatory guidance on accounting for GHG emission allowances.

In view of Nobes' (1998) assertion that harmonization is ultimately tied to firms' accounting practice systems, the theories trying to explain firms' disclosure decisions are also the underlying fundamentals to analyze *de facto* (material) disclosure harmony, as illustrated in the next figure. Therefore, this chapter proceeds with disclosure theories that, along with contingency theory, intend to explain corporate disclosure, focusing in particular the release of environmental information.

Figure 4-2: Determinants of disclosure decision and *de facto* disclosure harmony



Source: Adapted from Rahman *et al*. (2002, p. 49), with author's additions.

4.2. Theoretical background of corporate disclosure

Disclosure is a complex phenomenon that several theories attempt to explain[4]. In accordance to agency theory (Jensen and Meckling, 1976), accounting disclosure can be regarded as a tool to reduce agency costs. In the same vein, positive accounting theory (Watts and Zimmerman, 1978, 1990; Leftwich *et al*., 1981) state that contracting costs (consisting of agency costs as well as transaction costs, information costs, renegotiation costs, and bankruptcy costs) are crucial to explain accounting choice (and thus disclosure).

Based on the assumption that economic agents are rational and will act in an opportunistic manner to maximize their wealth, positive accounting theory conceives the firm as a pool (nexus) of contracts that are necessary to get self-seeking individuals to agree to cooperate. Considering the contracting costs associated with these contracts, positive accounting theory holds that managers will opportunistically select

[4] Refer to Healy and Palepu (2001) for a detailed review of the empirical disclosure literature. Refer to Mathews (1984, 1997, 2000, 2003, 2004), Gray *et al*. (1995a), Berthelot *et al*. (2003), and Parker (2005) for detailed review of theoretical and empirical research on social and environmental disclosure.

measurement and disclosure policies that will lead to an increase in their welfare (opportunistic perspective), and assumes that firms' accounting decisions are affected by the will to minimize contracting costs (efficiency perspective) (Watts and Zimmerman, 1978; Holthausen, 1990).

Beside the contribution to reduce agency conflicts between contracting parts, positive accounting theory also envisages voluntary disclosure as a tool to manage political costs. According to Watts and Zimmerman (1978, 1990), high visibility firms face high political costs, and therefore are likely to disclose more information in order to avoid potential pressure from governmental regulatory bodies, to reduce the likelihood of adverse political actions by other pressure groups, and ultimately to mitigate expected political costs.

Beyond the role of reducing agency conflicts or managing political costs, voluntary disclosure can also be understood as a way to send a particular information (sign) to the market. In the light of signaling theory (Spence, 1973; Ross, 1977; Morris, 1987), information asymmetry is the key factor to explain why managers in high-quality firms are motivated to voluntarily disclose private information. The rationale is that the withholding of private information leads external investors to interpret such absence as the existence of bad news (Grossman, 1981). So, managers are motivated to use disclosure as a tool to signal firm's good performance, and to reduce information asymmetry.

In the same vein, cost of capital theory states that managers have incentives to provide voluntary disclosure in order to reduce information asymmetry between informed and non-informed market participants, and consequently reduce the firm's cost of capital (Diamond, 1985; Diamond and Verrecchia, 1982, 1991; Baiman and Verrecchia, 1996).

Notwithstanding, despite the above mentioned potential benefits, disclosure can also harm firm's competitive position. In the view of proprietary costs theory (Verrecchia, 1983; Dye, 1985; Darrough and Stoughton, 1990; Wagenhofer, 1990; Darrough, 1993) managers take into account not only the benefits of disclosure but also inherent costs, and do not disclose when costs outweigh the benefits. Disclosure costs include costs to prepare and disseminate the information, as well as the costs of appropriation of the

information by third parties to inflict charges upon the firm (proprietary costs).

Overall, agency theory, positive accounting theory, and other approaches derived from economic theory, analyze financial reporting, in the light of information asymmetry and agency conflicts, as a strictly economic decision. Within this framework, corporate environmental disclosure can be understood as an outcome of management's assessment of the costs and the benefits to be derived from additional disclosure, namely the benefits from a reduction in information asymmetry as well as in information gathering costs to be assumed by investors (information costs), and the costs resulting from disclosure of proprietary information (proprietary costs).

Although environmental disclosure may be regarded on the basis of cost-benefit outcomes (Berthelot *et al*., 2003; Cormier and Magnan, 2003; Gray *et al*., 1995a), such framework is sometimes pointed to in related literature as a reductive vision of the environmental issues (Mathews, 1984; Arrington and Francis, 1989; Tinker and Okcabel, 1991; Gray *et al*., 1995a; Deegan, 2002; Milne, 2002; Cormier *et al*., 2005), because it is focused on agency problems between managers, shareholders, and creditors, while many of the users of environmental information (e.g., environmentalists and other pressure groups) are not confined to strict economic rationality.

In a more comprehensive way, the approaches derived from social and political theories conceive environmental disclosure as a central component of the interchange between firms and society. In this area, the most common perspectives are: (i) the legitimacy theory (early theoretical contributions from, amongst other, Schocker and Sethi, 1974; Dowling and Pfeffer, 1975; Hogner, 1982; Patten, 1992; Lindblom, 1994); (ii) the stakeholder theory (early theoretical contributions from, amongst other, Ansoff, 1965; Freeman, 1983; Freeman and Reed, 1983; Ullmann, 1985; Evan and Freeman, 1988; Clarkson, 1995; Roberts, 1992; Donaldson and Preston, 1995); and (iii) the institutional theory (early theoretical contributions from, amongst other, Meyer and Rowan, 1977; Scott, 1987; Zucker, 1987; DiMaggio and Powell, 1983; Oliver, 1991).

While agency theory and positive accounting theory give emphasis to the relations between managers and investors, disregarding other social actors, legitimacy, stakeholder and institutional approaches refer to a wider notion of the firm, relying on

the concept of social contract, according to which the access to resources and the survival of organizations are not automatically assured but they depend on the perception of a firm's legitimacy. Conceiving the firm as a part of the social system, the legitimacy theory seeks to explain disclosure practices by reference to the values, standards, customs and attitudes of the majority of the society in which the firm is inserted. It is the exercise of activities consistent with social values that, ultimately, will ensure businesses' survival. So, disclosure decisions can be understood as a firm's strategy for gaining the acceptance and the approval of the society. From this point of view, environmental disclosure is envisaged as a way to communicate with the public and to convince the society that the firm is to match their expectations. Lindblom (1994) classifies legitimation strategies in four categories:

1. Educate and inform the relevant publics about the significant changes that have occurred in firms' performance and activities.
2. Change the perceptions of the relevant publics with respect to the firm, without changing its actual behavior.
3. Manipulate perception, diverting the attention of a particular problem to other related issues, using, for instance, emotive symbols.
4. Change external expectations regarding firm's performance.

It should be noted that the purpose will be to obtain, maintain or strengthen legitimacy among the *relevant publics* and not necessarily among all agents. Likewise, the stakeholder theory also allows to stand that managers are encouraged to disseminate information aimed at particular groups of stakeholders (those who possess strongest influence), signaling, by this way, that they are to act in accordance with the interests and the expectations of those groups[5].

Actually, the stakeholder theory highlights the influence that not only shareholders and creditors, but also other groups (e.g., employees, consumers, suppliers, public authorities, non-governmental organizations) exert on disclosure decisions. With this in

[5] There are several branches of stakeholder theory. Deegan (2002) identify two variants: ethical or normative; and managerial or positive. The first holds that all stakeholders have the right to be treated fairly by a company. The second explains corporate social and environmental disclosure as a way of managing the firm´s relationship with different stakeholders. In the present study, the managerial branch is the one under consideration.

mind, disclosure is an instrument to respond to the information needs of the various interested parties, and managers will tend to use it to manage or to handle the most powerful stakeholders[6] in order to guarantee their support.

In the light of the legitimacy and stakeholder theories, the interaction with the environment in ways considered legitimate is, therefore, a necessary condition for firms' subsistence. This concept of organizational legitimacy is also present in the institutional theory (Deegan, 2002; Chen and Roberts, 2010). The process through which an organization fits the expectations of the environment can be analyzed, in the light of institutional theory, through the notion of institutional isomorphism in its three sorts: coercive; mimetic and normative (Deegan, 2002; Baker and Barbu, 2007). From this perspective, institutional pressure influences the intensity with which sustainable development and disclosure practices spread between firms (Jennings and Zandbergen, 1995; Neu *et al*., 1998; Baker and Barbu, 2007).

The legitimacy theory became the most widely used in empirical studies on voluntary environmental disclosure (Deegan, 2002). But it is also common the articulation with stakeholder and institutional theories, given the degree of complementarity and the overlap that exists between these three approaches (Gray *et al*., 1995a; Deegan, 2002; O'Donovan, 2002; Cormier *et al*., 2005; Parker, 2005; Chen and Roberts, 2010; Eugénio, 2010).

Consistent with prior literature, a multi-theoretical framework is adopted in the present investigation to address research questions. In this regard, Deegan (2002) notes that approaches derived from social and political theories are not dissenting and the minor differences that characterize them are useful to shed more light on some aspects of environmental reporting that otherwise could stay less clear. In the same line, Chen and Roberts (2010) argue that it is possible to reach compatible interpretations from legitimacy theory, stakeholder theory, and institutional theory and the selection and application of these theories depends on the focus of the study. In a broader sense, authors like Cormier *et al*. (2005) state that disclosure decision can be analyzed through

[6] Terms such as *relevant publics*, *constituents*, *social actors* and *conferring publics* can be found in related literature to describe the groups of stakeholders with the ability to confer or to withdraw legitimacy (O'Donovan, 2002).

a multi-tiered conceptual background in which disclosure is an outcome from management's assessment of economic incentives, public pressures, and institutional constraints and processes[7].

In general, the currents that are based on the concept of organizational legitimacy seem particularly suited to explain voluntary environmental disclosure. However, they do not appear robust to deal with the withholding of mandatory disclosure by managers. Actually, the theories assuming that firms are motivated by legitimacy-seeking behaviors can explain why firms are compelled to respond to institutional pressure and want to be seen as conforming to the rules, but do not provide plausible arguments to explain non-compliance (Adams *et al.*, 1995, p. 104).

For analyzing disclosure practices in regulated contexts, it appears more consistent the approach proposed by Oliver (1991), and adopted by, amongst others, Neu *et al*. (1998) and Criado-Jiménez *et al*. (2008). This is a refinement of the institutional theory that integrates in the analysis the possibility for firms to adopt distinct strategies in response to institutional processes (*acquiesce*, *compromise*, *avoid*, *manipulate*, *defy*), ranging from the obedience to the rules till the non-compliance with them. In the present investigation, the issuance of compulsory dispositions for firms linked to the Spanish allowances allocation plan, gives rise to an opportunity research to use an impression management perspective to analyze firms' strategic responses, and to evaluate the effectiveness of enforced regulations.

Finally, because firms do not operate in a vacuum, international differences in the ways in which organizations pursue and communicate their corporate social responsibilities are contextualized in the light of their institutional environment in home-country by, amongst others, Aguilera and Jackson (2003), Midttun *et al*. (2006), Deeg and Jackson (2007), Matten and Moon (2008), Jackson and Apostolakou (2010), Carnevale *et al*. (2012), and Faisal *et al*. (2012). To this end, national political economies are generally compared by referring to the ways in which firms solve their coordination problems, both internally, with employees, and externally, with a wide range of actors.

[7] Concurrently, as described by Doh and Guay (2006, p. 56), some efforts have been made to integrate principles of stakeholder and agency perspectives on management (Hill and Jones, 1992), and to operationalize stakeholder concepts so that they have instrumental value (Donaldson and Preston, 1995; Jones, 1995).

The strands of corporate social responsibility research that seek to explain why corporate behavior varies across nations, often distinguish between two main types of national business systems (varieties of capitalism approach): (i) liberal market economies (LME) characterized by equity financing, dispersed ownership, active markets for corporate control, weak inter-firm cooperation, and flexible labor markets (e.g., US or UK); and (ii) coordinated market economies (CME) characterized by long-term debt finance, ownership by large block-holders, weak markets for corporate control, strong inter-firm cooperation and rather rigid labor markets (e.g., Continental Europe or Japan). Hall and Soskice (2001) identify a third group of nations (including Italy, France, Spain, Portugal, Greece) that are known as "Mediterranean" or "mixed" market economies (MME), because they show a more ambiguous position combining features of the two preceding groups (Hall and Gingerich, 2004).

More recently, when analyzing political economy of corporate social responsibility in Western Europe, Midttun *et al*. (2006) recognize four distinct models: Anglo-Saxon; Mediterranean; Central European; and Nordic. According to Midttun *et al*. (2006, pp. 373-375), the Nordic countries are the most advanced welfare states, and the most "socially embedded socio-political models", while the Anglo-Saxon countries are "polar opposites, scoring relatively low on most dimensions of social embeddedness of the economy". Between those two extremes lie the Continental and the Mediterranean models.

There is great acceptance that domestic business systems are likely to affect firms' strategic choices, namely due to the different patterns of stakeholder involvement in corporate decision making. However, there is no general consensus on their overall effect on corporate behavior (Campbell, 2007; Matten and Moon, 2008; Jackson and Apostolakou, 2010).

Campbell (2007) argues that firms are more likely to behave in socially responsible ways when they are engaged in institutionalized dialogue with stakeholders, which is more likely to occur in CME. Nevertheless, the stronger institutionalized patterns of stakeholder involvement in these countries may also lead to a smaller need for firms to communicate their environmental practices (Jackson and Apostolakou, 2010). On the other hand, in LME where stakeholder involvement is not strongly established, the

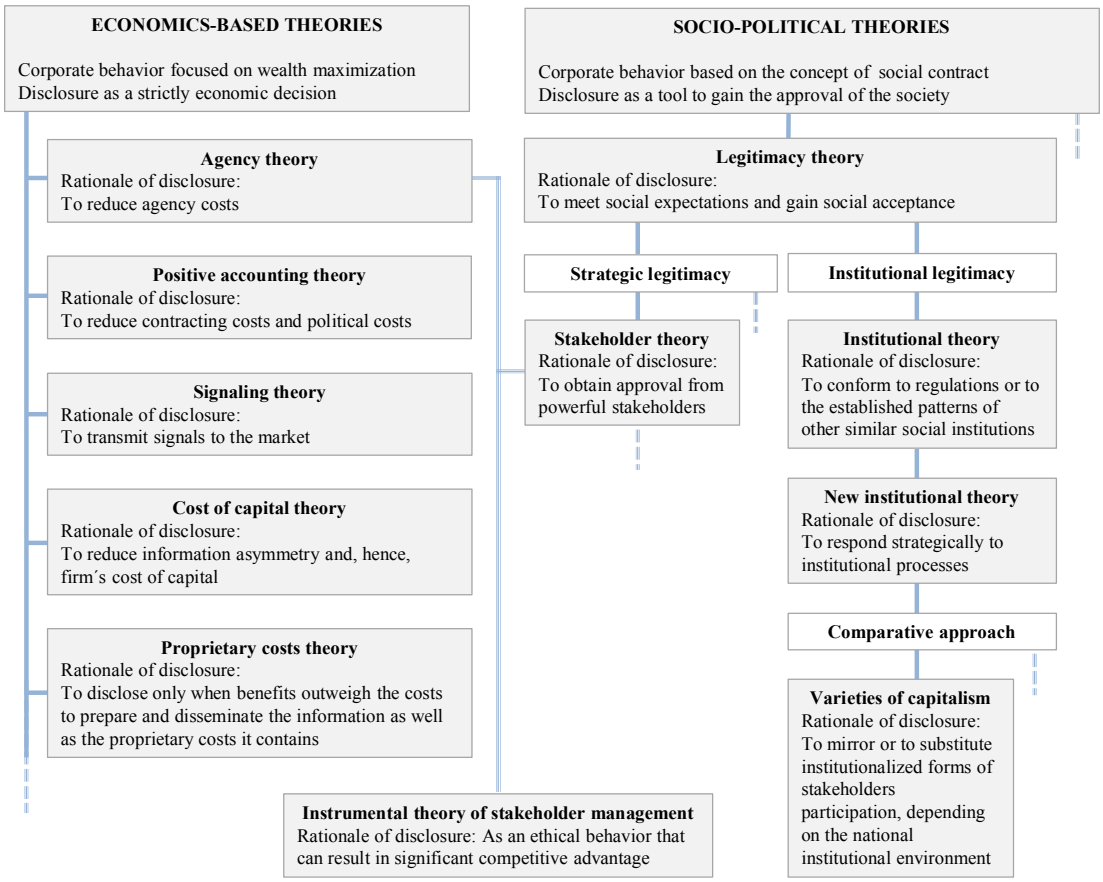
absence of institutionalized stakeholder participation may induce firms to communicate more about their activities. That is to say, where regulations are minimal, greater pressure may come from stakeholders towards the development of responsible environmental practices at firm-level, and firms have a chance to differentiate themselves from their competitors communicating more about their environmental initiatives. Hence, in LME disclosure may act largely as a substitute for more institutionalized patterns of stakeholder involvement (Matten and Moon, 2008; Jackson and Apostolakou, 2010).

It is beyond the scope of this study to fully investigate patterns of disclosure across the different types of business systems. However, considering that national business systems are likely to affect firms' strategic choices, namely in the ways in which they communicate with stakeholders (Midttun *et al*., 2006; Freedman and Jaggi, 2005, 2011; Carnevale *et al*., 2012; Faisal *et al*., 2012), the influence of institutional environment in firms' home-country will be incorporated in the analysis when examining diversity of disclosure practices at EU-15 level.

Figure 4-3 summarizes theoretical background for corporate accounting disclosure, as described in this section. It should be noted that this is a partial and simplified representation, as it depicts only the theoretical strands that are relevant for the present investigation, and ignores the above mentioned overlap between several branches.

This study proceeds with the review of prior evidence to support the formulation of research questions, addressing, in particular, investigation focused on environmental disclosure, and highlighting how the general theoretical framework presented above has been applied to empirical research in this area. Next section comprehends a discussion on disclosure practices and *de facto* (material) accounting harmony under mandatory guidance. Then, section 4-4 addresses disclosure practices and *de facto* (material) accounting harmony due to voluntary processes, focusing in particular the cases of firms acting internationally, and firms pertaining to industries with high environmental impact (environmentally sensitive).

Figure 4-3: Synthesis of theoretical background for corporate disclosure



Note: The dotted lines indicate that there are other theoretical branches.
Source: Gray *et al.* (1996, p. 49), Chen and Roberts (2010, p. 653), with author's additions.

4.3. Previous empirical evidence on disclosure and *de facto* accounting harmony under mandatory guidance

Level of disclosure under mandatory guidance

Whenever the distinction between mandatory and voluntary disclosure is not set out clearly or depends upon the assessment of materiality, management may use discretion when determining what information represents a mandatory disclosure, as described by, amongst others, Barth *et al.* (1997), Heitzman *et al.* (2010), and Lo (2010). Nevertheless, limited attention has been given in empirical research to analyze management decisions when facing mandatory disclosure regimes.

Many of the prior literature generally assume that firms select the extent of voluntary

disclosure, but do not exercise discretion when facing mandatory guidelines. The underlying assumption is that firms will adjust their practices to comply. However, despite the greater likelihood of opportunistic behavior under voluntary than under mandatory disclosure, even mandatory rules do not prevent strategic withhold of environmental information (Barth *et al*., 1997; Larrinaga *et al.*, 2002; Mobus, 2005; Frost, 2007; Llena *et al*., 2007; Criado-Jiménez *et al*., 2008; Peters and Romi, 2013).

When analyzing the impact of regulatory framework on management commentary reports, Seah and Tarca (2006) notice that, in accordance with Verrecchia's (1991) model, under a mandatory regime, both the costs and the benefits of disclosure potentially increase, changing the equilibrium point and expanding the level of a firm's disclosure. Notwithstanding, when examining economic consequences of mandatory IFRS adoption in the UK, Christensen *et al*. (2007) remark that the harmonization of standards does not affect all firms in a uniform way, and the response to mandatory rules varies across firms being conditional on the perceived benefit.

With regard to the disclosure of mandatory *environmental* information, apart from the works of Freedman and Stagliano (1995), Barth *et al*. (1997), and Bebbington (1999), empirical research is lacking until the 90's of last century partially due to the generalized absence of specific regulation on this field.

Table 4-1 summarizes prior empirical evidence on the association between mandatory guidance and level of disclosure concerning environmental information. Amongst early contributions, it is worth noting the study conducted by Barth *et al*. (1997) concerning the case of electric utility (as an environmentally sensitive and regulated industry). According to Verrecchia's (1991) model, firms with greater potential benefits from disclosure tend to disclose more. With this in mind, Bart *et al*. (1997) hold that, all else equal, to the extent that utility firms can pass their environmental costs on to consumers, they achieve greater benefits from disclosure than other firms. Additionally, the authors argue that it is also plausible that utilities face lower costs associated with revealing information to competitors, than firms within other sectors. Actually, when analyzing factors influencing firm's decisions to disclose mandatory information about environmental liabilities, for a sample of 257 US firms, from 1989 to 1993, findings confirm this hypothesis, and Barth *et al*. (1997, p. 60) conclude with an important

implication to the present research: all else equal, "...utilities will disclose more about their environmental liabilities (than other firms) because they ultimately pass these costs on to consumers through higher rates".

Table 4-1: Previous empirical evidence on the association between mandatory guidance and level of mandatory environmental disclosure

Positive association between mandatory guidance and level of mandatory environmental disclosure			
	Author(s)	Sample	Period
Proven	Barth *et al*. (1997)	257 US firms	1989-1993
	Bebbington (1999)	550 Danish firms	1999
	Larrinaga *et al*. (2002)	70 Spanish firms	1997-1999
	Frost (2007)	71 Australian firms	1997-2000
	Llena *et al*. (2007)	51 Spanish firms	1992/4|2001/2
	Seah and Tarca (2006)	174 firms from Australia, Canada, UK, US	2003
	Criado-Jiménez *et al*. (2008)	78 Spanish firms	2001-2003
	Acerete *et al*. (2011)	21 Spanish firms	1997-2000
	Barbu *et al*. (2014)	114 firms from France, Germany, UK	2007
Not proven	Fallan and Fallan (2009)	822 annual reports of firms listed in Oslo Stock Exchange | 34 to 60 firms per year	1987-2005
	Peters and Romi (2013)	300 US firms	1996-2005

Not proven: mixed results, contrary signal or not statistically significant association (p>0,05).

Later, when testing the effectiveness of a standard which requires all the Spanish firms to include environmental disclosures in their financial statements[8], Larrinaga *et al*. (2002) find that, despite an increase of environmental disclosures in the notes to the annual accounts, heterogeneity persists both in terms of quantity and quality of information. On this view, Larrinaga *et al*. (2002) conclude that the compliance level was low and the firms who were reporting some environmental information neglect those aspects of the regulation that were not in their interest to reveal. The authors point out that these results do not support the arguments in favor of compulsory standards as a factor of increasing bad news in the annual reports (Deegan and Gordon, 1996). Moreover, grounded on Owen *et al*.'s (1997) theoretical distinction between *administrative* and *institutional* reforms, Larrinaga *et al*. (2002) conclude that the Spanish standard on environmental disclosure was not enough to enable new accountability relationships and to empower stakeholders.

[8] In Spain, the first regulation concerning environmental mandatory disclosure in the annual accounts was issued in March of 1998 through the adapted *Plan General de Contabilidad* for electric utilities (RD 437/98). In the same year, similar dispositions were issued for a number of economic sectors such as water supply, sewage industry and road transport facilities. In 2000, the Ministry of Justice issues some forms of financial statements including environmental disclosure requirements intended for all Spanish firms. In 2002, following the Recommendation EC (2001), the ICAC issued a specific standard, the 2002 ICAC Resolution (ICAC, 2002), extending the requirement for disclosing environmental accounting information in financial statements to all Spanish firms.

Following the Recommendation EC (2001), the Spanish accounting standard-setting body issued a new standard (ICAC, 2002), extending the requirement for disclosing environmental information in the annual accounts to all Spanish firms. When evaluating disclosure by 51 large firms operating in Spain, Llena *et al*. (2007) conclude that for the first year in which the new environmental accounting standard was in force (2002), a significant increase of environmental disclosures in the notes to the annual accounts occurred. However, heterogeneity in both the level and the quality of disclosure persisted. In particular, Llena *et al*. (2007) point out that mandatory disclosure in the annual accounts seems biased towards more good news (expenses and investments) rather than bad news (provisions and contingencies). Later, when evaluating environmental disclosure in the annual accounts of Spanish toll motorway concessionaires, from 1999 to 2007, Acerete *et al*. (2011) find low levels of disclosure and compliance among sample firms, and as a result the authors conclude that sample firms had adopted environmental reporting regulations merely as an *administrative* reform.

Also, a survey of the extent of compliance with the revised standard (ICAC, 2002) was carried by Criado-Jiménez *et al*. (2008). The results suggest that progressive and improved regulation enhance the level and the quality of environmental disclosure, namely on bad news. But the study also shows the persistence of a significant level of non-compliance from 2001 to 2003. Criado-Jiménez *et al*. (2008) conclude that disclosure was used to manage the public impression of the environmental performance of the firm, namely reporting good news rather than bad news, disclosing ritual information, and selecting the information to be disclosed in each reporting media. In the same line, when examining if decisions regarding mandatory disclosure are made strategically, Alexander *et al*. (2011) conclude that firms are less likely to disclose when the event represents bad news. Overall, evidence seems consistent with the hypothesis of strategic non-compliance to mandatory requirements, when disclosures would include negative news and the expected costs of subsequent detection are low.

Notwithstanding, in the light of the impression management approach, Criado-Jiménez *et al*. (2008) posit that concealment strategies confirm the strength of regulation rather than its weakness, because, in response to more strict regulation, firms cannot simply

dismiss the norm. On the contrary, they are compelled to accept it, although symbolically. The authors point out that concealing non-compliance is not the same as acquiescence, but it also differs from dismissal and, in that sense, such strategy can be used by firms to attain legitimacy, although denying to stakeholders some of the information that the standard intended to assure. According to Criado-Jiménez *et al*. (2008) further regulation is likely to attract the attention of more powerful stakeholders, and therefore is a potential driver of more effective environmental disclosure.

Likewise, authors such as Gray *et al*. (2006), Deegan and Rankin (1996, 1997), Owen *et al*. (1997), Freedman and Jaggi (2005, 2011), Frost (2007), and Peters and Romi (2013) are in favor of mandatory guidance establishing strict environmental disclosure requirements. The rationale is that when standards are poorly designed, and the expectations as to its enforcement are low, empirical evidence confirms that a dismissal strategy is likely to occur. On this view, when analyzing the impact of the introduction, in 1998, of mandatory environmental reporting guidelines in Australia, Frost (2007) notice that, although there was a significant increase in disclosure, the variation both in the presentation, and in the extent of information, suggests considerable differences regarding management interpretation of the standard. Also, when examining firms' adherence to US Securities and Exchange Commission (SEC) mandated disclosures of environmental sanctions, from 1996 to 2005, Peters and Romi (2013) find prevalence of non-compliance and remark that simply creating additional reporting regulation will not necessarily lead to real change in disclosure, unless such requirements are either clearly monitored or delineated to remove management discretion.

In Portugal, the first accounting standard on environmental matters (DC 29 *Environmental Matters*) was issued following the Recommendation EC (2001). Da Silva Monteiro and Aibar-Guzmán (2010) examine the influence of this new Portuguese standard, considering a sample of large firms, from 2002 to 2004. Since in this period it was still not in force[9], the aim of the research was to evaluate the impact of its approval on the firms' decision to voluntarily disclose environmental information in their annual

[9] This accounting standard (DC 29 *Environmental Matters*, superseded by NCRF 26), establishing the obligation for Portuguese firms to disclose environmental information in their annual accounts and regulating the information to be included their annual reports, was issued in 2002 but, actually, it only came into force in 2006.

reports, by comparing levels of disclosure prior to, and immediately after, its issuance. Findings indicate that, despite the low level of disclosure from 2002 to 2004, the extent of environmental information has increased, as well as the number of firms making such releases. Da Silva Monteiro and Aibar-Guzmán (2010) assume that this change in disclosure behavior, between 2002 and 2004, illustrates that the coming standard was starting to have an impact, even before entering into force, which is in line with Criado-Jiménez *et al.*'s (2008) assertion that further regulation is a potential driver of disclosure, namely because it is likely to attract the attention of powerful stakeholders.

In contrast, when exploring the development of environmental disclosure during periods of voluntarism and during periods with changed statutory requirements in Norwegian firms, from 1987 to 2005, Fallan and Fallan (2009) conclude that enforced regulations have merely a significant immediate effect on mandatory disclosure, but ultimately firms do not fully comply with such requirements. On view of this, the authors argue that no statutory regulations are needed to make firms increase and adapt their environmental disclosure to the demands from their stakeholders, and to legitimate their existence towards society. Nonetheless, Fallan and Fallan (2009) also admit that those authors who support mandatory guidance may claim that, at least, a minimum of comparable information is more likely to be ensured by regulations.

At EU level, when analyzing environmental mandatory disclosures by firms complying with IFRS, for a sample of 114 French, German, and UK firms included in the Stoxx 600, Barbu *et al*. (2014) point out that environmental disclosures imposed by IFRS increase with firm size, just like voluntary environmental disclosures. Furthermore, Barbu *et al*. (2014) notice that the level of compliance varies across countries, suggesting that the level of environmental information in the annual reports increases with the intensity of the environmental disclosure constraints in the country where the firm is located. In view of this, Barbu *et al*. (2014) assume that application of IFRS is affected by the reporting practices that prevailed in firms' home-country prior to IFRS adoption. Overall, these outcomes are in line with Nobes (2006, 2008), and Kvaal and Nobes (2010) suggesting that national accounting patterns are likely to continue influencing financial reporting behavior under IFRS, namely due to differences in national guidance and legal systems.

De facto accounting harmony under mandatory guidance

With regard to *de facto* (material) disclosure harmony, literature dealing with the impact of firm-specific characteristics on corporate mandatory disclosure is scarce[10]. On this subject, it is worth noting a study conducted by Rahman *et al*. (2002) for a sample of 146 Australian and New Zealand listed firms, in 1993, examining measurement criteria and disclosure practices concerning mandatory as well as non-mandatory items, in the annual accounts.

Based on accounting disclosure literature, Rahman *et al*. (2002) predict that firms larger in size and with high levels of decentralization are more likely to have greater need to use a variety of accounting policies and to release additional information. Therefore, the authors hypothesized higher diversity of disclosure among larger firms. On the contrary, regarding leverage and ownership concentration, a positive sign was predicted for the association with disclosure practice harmony. Additionally, Rahman *et al*. (2002) predict that disclosure practice harmony is not independent of industry.

As expected, results show that the association between disclosure practice harmony and firm-specific characteristics is more frequent for voluntary than for mandatory disclosure. With respect to voluntary disclosure categories, almost all outcomes confirm predictions (the single exception is the connection between leverage and disclosure practice harmony where a non-significant wrong signal association was found). Differently, as regards to mandatory disclosure categories, Rahman *et al*. (2002) only find evidence that disclosure practice harmony is not independent from industry affiliation or the level of decentralization within the firm, being that the other results concerning mandatory information do not corroborate the authors' predictions.

Building on prior investigation, the present study intends to evaluate the "disciplinarian effect" of mandatory guidance over the harmony in, and the level of carbon financial disclosure among EU-15 firms.

[10] Refer to Ali (2005) for a review of empirical research on international accounting harmonization.

4.4. Previous empirical evidence on disclosure and *de facto* accounting harmony due to voluntary processes

The increasing extent of corporate voluntary environmental disclosure in the last decades is well documented in prior research[11], and in line with disclosure theories, findings indicate that firms with different characteristics are likely to adopt different disclosure strategies.

In general, both within-country and cross-country studies indicate that the level of voluntary environmental disclosure is significantly associated with firm-specific characteristics such as size, industry type, listing status, international activity, ownership structure, profitability, and financial leverage. However, only size and affiliation in industries with high environmental impact are consistently reported as being positively associated with the level of voluntary environmental disclosure. With regard to other firm characteristics, findings are mixed as discussed in sections 4.4.1. to 4.4.5.

4.4.1. Firm size

Firm size and level of voluntary disclosure

Generally, prior research reports a direct relationship between firm's size and the level of voluntary environmental disclosure (refer to Table 4-2), and a number of theoretical arguments have been settled in support of this evidence (Lang and Lundholm, 1993, pp. 250-251). However, it is not absolutely clear what the size variable really measures, as results might well correspond to an aggregate effect of diverse firm-specific features correlated with dimension. As advanced by Ball and Foster (1982, p. 191) firm size cannot be regarded as an independent firm-specific characteristic because it could be "…used to proxy for many (apparently) different and competing constructs…" such as competitive advantages, economics of scale in information production, management ability and advice, wider ownership base, political costs, media attention, analysts coverage, or public visibility.

[11] Refer to Mathews (1984, 1997, 2000, 2003, 2004), Gray *et al*. (1995a), Berthelot *et al*. (2003), and Parker (2005) for detailed review of theoretical and empirical research on social and environmental disclosure.

Table 4-2: Previous empirical evidence on the association between size and level of voluntary environmental disclosure

Positive association between firm's size and level of voluntary environmental disclosure (VED)			
	Author(s)	Sample	Period
Proven	Ness and Mirza (1991)	131 UK firms	1984
	Patten (1991)	128 US firms	1985
	Patten (1992)	21 US firms	1989
	Deegan and Gordon (1996)	197 Australian firms	1980-1991
	Hackston and Milne (1996)	47 New Zealand firms	1992
	Moneva and Llena (1996)	47 Spanish firms	1992
	Adams *et al*. (1998)	150 firms from 6 European countries	1992
	Neu *et al*. (1998)	330 Canadian firms	1982-1991
	Clarke and Gibson-Sweet (1999)	95 UK firms	1996
	Cormier and Magnan (1999)	33 Canadian firms	1986-1993
	Alnajjar (2000)	500 US firms	1990
	Bewley and Li (2000)	188 Canadian firms	1993
	Archel and Lizarraga (2001)	56 Spanish firms	1995-1998
	Cormier and Gordon (2001)	3 Canadian electric utility firms	1985-1996
	Gray *et al*. (2001)	100 UK firms	1988-1995
	Patten (2002)	131 US firms	1990
	Archel (2003)	68 Spanish firms	1994-1998
	Bichta (2003)	2 Greek firms	Nov97-Feb98
	Cormier and Magnan (2003)	50 French firms	1992-1997
	García-Ayuso and Larrinaga (2003)	112 Spanish firms	1991-1995
	Elijido-Ten (2004)	40 Malaysian firms	1999-2001
	Cormier *et al*. (2005)	76 German firms	1992-1998
	Freedman and Jaggi (2005)	120 firms from Europe, America, Asia	2000-2002
	Gao *et al*. (2005)	33 Hong Kong listed firms	1993-1997
	Brammer and Pavelin (2006)	447 UK firms	2000
	Boesso and Kumar (2007)	72 Italian and US firms	2002
	Van Staden and Hooks (2007)	32 New Zealand firms	2003
	Branco and Rodrigues (2008)	43 Portuguese firms	AR03/Web04
	Brammer and Pavelin (2008)	447 UK firms	2000
	Haddock-Fraser and Fraser (2008)	166 UK firms	2005
	Stanny and Eli (2008)	US S&P 500 firms	2007
	Reid and Toffel (2009)	524 US firms	2006-2007
	Reverte (2009)	46 Spanish firms	2005-2006
	Jackson and Apostolakou (2010)	274 firms from 16 European countries	2007
	Da Silva M. and Aibar-G. (2010)	109 Portuguese firms	2002-2004
	Freedman and Jaggi (2011)	510 firms from EU, America, Asia	2006
	Mahadeo *et al*. (2011)	165 firms from Mauritius Island	2004-2007
	Rupley *et al*. (2012)	127 US firms	2000-2005
	Salama *et al*. (2012)	169 US firms	1999
	Setyorini and Ishak (2012)	183 Indonesian listed firms	2005-2009
	Choi *et al*. (2013)	100 Australian firms	2006-2008
	Stanny (2013)	US S&P 500 firms	2006-2008
Not proven	Cowen *et al*. (1987)	US Fortune 500 firms	1978
	Belkaoui and Karpik (1989)	23 US firms	1973
	Roberts (1992)	130 US firms	1981-1986
	Faisal *et al*. (2012)	125 firms from 24 countries	2009

Not proven: mixed results, contrary signal or not statistically significant association (p>0,05).

Most of previous studies looks at disclosure in a single country context (refer to Table 4-2), being that some of them (Stanny and Eli, 2008; Reid and Toffel, 2009; Choi *et al*., 2013; Stanny, 2013) address voluntary disclosure related to carbon emissions. In general, findings are consistent with existing literature on voluntary disclosure suggesting that firms with higher visibility and subject to more scrutiny and public pressure due to their size tend to provide additional information.

With regard to multi-country studies dealing with voluntary environmental disclosure and firms' size, it is worth noting the work of Adams *et al*. (1998) by its scope. Unlike most of the studies at that time, rather than looking at the disclosures made by firms in a single nation, it covers firms domiciled in six European countries (France, Germany, Netherlands, Sweden, Switzerland, UK), allowing to evaluate the impact of country of domicile on the environmental disclosure decision. On the basis of the 1992 annual reports from 150 European firms, the authors conclude that, although the amount and the nature of information disclosed vary significantly across Europe, large firms are significantly more likely to disclose all types of corporate social information than small ones, in each and every one of the six countries under review.

Since the work of Adams *et al*. (1998) some multi-country studies have been conducted on this subject (e.g., Freedman and Jaggi, 2005, 2011; Boesso and Kumar, 2007; Jackson and Apostolakou, 2010; Faisal *et al*., 2012). Generally, evidence suggests a positive association between firm's size and level of voluntary environmental disclosure. However, when examining disclosure practices in a global context for a sample of 2009 sustainability reports from 125 firms belonging to 24 countries (of which 14 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherland, Norway, Portugal, Spain, Sweden, Switzerland, UK), Faisal *et al*. (2012) do not find a statistically significant relationship with size. The authors offer no particular explanation for this dissenting result, although remarking some differences between their findings and past literature, namely by reporting that, when compared with firms domiciled in Anglo-Saxon countries, large global firms from emerging markets communicate higher, not lower, levels of sustainability data.

Firm size and de facto accounting harmony of voluntary disclosure

While literature dealing with the impact of firm-specific characteristics on the level of voluntary disclosure is substantial, research on their implications for comparability of firms' accounts is scarce, as described by Ali (2005, 2006). When examining accounting practice harmony and firm characteristics, for a sample of 146 Australian and New Zealand firms, in 1993, Rahman *et al*. (2002) find strong evidence that *de facto* (material) accounting disclosure harmony is associated with firm characteristics, especially when the harmony of regulations (*de jure*) is weak or when there is no enforced guidance.

In particular, Rahman *et al*. (2002) predict a negative association between firms' size and disclosure practice harmony (measured by the Jaccard coefficient). Based on accounting disclosure literature, the authors argue that large firms have a greater need for using a variety of accounting policies and are more likely to disclose additional information. Therefore, Rahman *et al*. (2002) assume higher variability of accounting disclosure practices among large firms, than among small ones, and their findings do confirm a significant negative association between size and harmony of voluntary disclosure in the annual accounts.

Later, to evaluate international accounting harmonization, taking into consideration firm-specific characteristics, firm's operating circumstances, and country of domicile, Jaafar and McLeay (2007) examine harmony of accounting policy choice for a sample of 706 European firms from 13 countries (Austria, Belgium, Germany, Denmark, Finland, France, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, UK). The annual reports for the years 1991, 1995 and 1999 were analyzed concerning three items: inventory costing, goodwill, and depreciation of fixed assets. Based on a hierarchy of nested linear logistic models, Jaafar and McLeay (2007) conclude that, despite the weight of country differences, size is significant in explaining accounting policy choice for each one of the three selected items, in all the EU-13 Member States. Consequently, their findings suggest that large firms' choices differ from those of the smaller firms. However, Jaafar and McLeay's (2007) research design do not allow further conclusions about the relative level of harmony within each group of firms.

4.4.2. Industry affiliation

Industry affiliation and level of voluntary disclosure

Together with size, industry is the most common variable in order to explain levels of voluntary environmental disclosure, either in single-country or multi-country contexts.

In this respect, when explaining the disclosure of social and environmental information in the annual reports of UK firms, Gray *et al*. (2001, p. 348) argue that a model for satisfactory prediction of the level of voluntary disclosure will necessarily require an "industry-related corporate characteristic" as an explanatory variable.

With regard to cross-country evidence, when analyzing factors influencing corporate environmental and social disclosures in four European countries (Finland, Norway, Spain and Sweden), Halme and Huse (1997) conclude that industry appears to be the most important factor in explaining environmental disclosure in annual reports. In the same vein, when identifying factors influencing corporate environmental and social disclosures in six European countries (France, Germany, Netherlands, Sweden, Switzerland, UK), Adams *et al*. (1998, p. 2) underline the impact of firm-specific characteristics such as industry affiliation by stating that with "... increasing globalization of business and international harmonization of accounting standards, country- and culture-specific factors may weigh less than corporate- and industry-specific factors".

Later, when analyzing the web sites of the 200 largest multinational firms, in 2002, Jose and Lee (2007) conclude that firms in industries that have a large environmental footprint provide more environmental disclosures, than firms in less pollutant industries. More recently, when investigating the institutional determinants of corporate environmental and social disclosures in sixteen European countries (Austria, Belgium, Denmark, France, Finland, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK), Jackson and Apostolakou (2010, p. 387) identify a "very strong and robust influence of sectoral-level factors" in explaining environmental disclosure practices.

Table 4-3: Previous empirical evidence on the association between industry affiliation and level of voluntary environmental disclosure

Positive association between affiliation in high environmental impact industries and level of VED			
	Author(s)	Sample	Period
Proven	Cowen *et al*. (1987)	US Fortune 500 firms	1978
	Ness and Mirza (1991)	131 UK Firms	1984
	Hackston and Milne (1996)	47 New Zealand firms	1992
	Patten (1991)	128 US firms	1985
	Patten (1992)	21 US firms	1989
	Roberts (1992)	130 US firms	1981-1986
	Gamble *et al*. (1995)	234 US firms	1986-1991
	Niskala and Pretes (1995)	75 Finnish firms	1987-1992
	Deegan and Gordon (1996)	197 Australian firms	1980-1991
	Gamble *et al*. (1996)	276 firms from 27 countries	1989-1991
	Hackston and Milne (1996)	47 New Zealand firms	1992
	Moneva and Llena, (1996)	47 Spanish firms	1992
	Li *et al*. (1997)	49 Canadian firms	1982-1992
	Halme and Huse (1997)	140 firms from 4 European countries	1992
	Adams *et al*. (1998)	150 firms from 6 European countries	1992
	Neu *et al*. (1998)	330 Canadian firms	1982-1991
	Clarke and Gibson-Sweet (1999)	95 UK firms	1996
	Cormier and Magnan (1999)	33 Canadian firms	1986-1993
	Bewley and Li (2000)	188 Canadian firms	1993
	Archel and Lizarraga (2001)	56 Spanish firms	1995-1998
	Gray *et al*. (2001)	100 UK firms	1988-1995
	Patten (2002)	131 US firms	1990
	Archel (2003)	68 Spanish firms	1994-1998
	Cormier and Magnan (2003)	50 French firms	1992-1997
	García-Ayuso and Larrinaga (2003)	112 Spanish firms	1991-1995
	Gao *et al*. (2005)	33 Hong Kong listed firms	1993-1997
	Brammer and Pavelin (2006)	447 UK firms	2000
	Boesso and Kumar (2007)	72 Italian and US firms	2002
	Cho and Patten (2007)	100 US firms	2001
	Jose and Lee (2007)	200 multinational firms	2002
	Van Staden and Hooks (2007)	32 New Zealand firms	2003
	Brammer and Pavelin (2008)	447 UK firms	2000
	Haddock-Fraser and Fraser (2008)	166 UK firms	2005
	Aerts and Cormier (2009)	158 US and Canadian firms	2002
	Reverte (2009)	46 Spanish firms/	2005-2006
	Jackson and Apostolakou (2010)	274 firms from 16 European countries	2007
	Freedman and Jaggi (2011)	510 firms from EU, America, Asia	2006
	Faisal *et al*. (2012)	125 firms from 24 countries	2009
	Hrasky (2012)	50 Australian firms	2005 and 2008
	Rupley *et al*. (2012)	127 US firms	2000-2005
	Salama *et al*. (2012)	169 US firms	1999
	Choi *et al*. (2013)	100 Australian firms	2006-2008
Not proven	Fekrat *et al*. (1996)	168 firms from 18 countries	1991
	Freedman and Jaggi (2005)	120 firms from Europe, America, Asia	2000-2002
	Branco and Rodrigues (2008)	43 Portuguese firms	AR03/Web04
	Stanny and Eli (2008)	US S&P 500 firms	2007
	Reid and Toffel (2009)	524 US firms	2006-2007
	Da Silva M. and Aibar-G. (2010)	109 Portuguese firms	2002-2004

Not proven: mixed results, contrary signal or not statistically significant association (p>0,05).

Overall, empirical research suggests that, either as a response to public pressure, or to avoid further regulation, firms pertaining to industries with high environmental impact (environmentally sensitive industries) tend to disclose more environmental information than firms operating in less pollutant activities (refer to Table 4-3).

In particular, a number of studies remark the influence of sector regulations on corporate disclosure in high environmental impact industries. The underlying assumption is that, due to their higher pollution propensity, those activities are generally subject to a wide variety of environmental regulations and, consequently, firms operating in those industries are more used to comply with more demanding requirements. As described by Jackson and Apostolakou (2010, p. 374), because of their impact on the environment and the attention they motivate among various stakeholders, high sensitive industries are more regulated and therefore firms within these industries will tend to adopt more organized and explicit environmental disclosure policies, either as a result of their own reaction to public pressure or because they are compelled to do so by governmental measures. However, with regard to corporate disclosure on GHG emissions, past research shows mixed results.

When examining voluntary information related to climate change and carbon emissions in annual reports and sustainability reports of 100 Australian firms, from 2006 to 2008, Choi *et al*. (2013) point out industry as a significant determinant of disclosure, and remark that, in response to the increased social and political pressures, sample firms in the carbon-intensive industries seem more likely to provide additional information on GHG emissions. Concurrently, instead of focusing in industry affiliation, Cowan and Deegan (2011) consider the quantities of pollution emissions, adjusted by the size of corporation, to measure firms' environmental impact, when evaluating corporate reaction to Australia's first national emission reporting scheme, for a sample of 25 firms, from 1998 to 2000. Again, results show a significant positive relationship between the quantities of pollution emissions (adjusted by firms' size), and voluntary release of information on GHG emissions in annual reports.

In contrast, when identifying factors associated with disclosure of information about the current and the expected effects of climate change, in 2007, by a sample of US S&P 500

firms, to institutional investors through the Carbon Disclosure Project (CDP)[12], in 2007, Stanny and Eli (2008) do not find a significant positive relation between disclosure and affiliation in carbon intensive industries. The authors offer no explanation for this unexpected result, being that sample size, due to the low rate of responding firms, may be a possible reason.

On the other hand, when examining, for a sample of 524 US firms, if firms that have been targeted by shareholder actions on environmental issues are more likely to publicly disclose information to the CDP, in 2006 and 2007, Reid and Toffell (2009) conclude that, compared to firms that had not been targeted by shareholder resolutions, firms that had been targeted, and were in environmentally sensitive industries are more likely to provide information. However, Reid and Toffell (2009) find no significant differences, between the environmentally sensitive and non-environmentally sensitive industries, in how other explanatory variables, rather than shareholders resolutions targeting, affected firms' propensity to respond to the CDP questionnaire.

With regard to multi-country studies, when analyzing GHG disclosures, in 2000, by 120 firms domiciled in Europe, Asia, and North and South America, Freedman and Jaggi (2005) notice that all the four industries in the sample (auto, oil, energy, and chemicals) show a positive and statistically significant relation with the disclosure index. The authors assume that all activities that are potentially impacted by the Kyoto Protocol are likely to provide extensive pollution disclosures, but do not identify significant differences between the industries covered by their study.

Later, when evaluating GHG disclosures, in 2006, by a sample of 510 firms domiciled in the EU, Japan, Canada, India or the United States, Freedman and Jaggi (2011) also use industry as a control variable (encompassing chemicals, utilities, materials, oil & gas, and consumer durables & capital goods). Regression results show positive and statistically significant relation between the disclosure index and each industry group, with the exception of consumer durables & capital goods. The authors offer no further

[12] Carbon Disclosure Project (CDP) is an international not-for-profit organization working to motivate companies to disclose their impacts on the environment and take action to reduce them. Given the lack of public information about the effects of climate change, institutional investors have asked information from companies through the CDP. The CDP questionnaire and the status of each firm's response are available at https://www.cdproject.net/. Last accessed on 19 July 2014.

explanation for this evidence, being that in both studies (Freedman and Jaggi, 2005, 2011) the highest positive coefficients are the ones related to energy and utilities, respectively.

Industry affiliation and de facto accounting harmony of voluntary disclosure

With regard to *de facto* (material) accounting harmony, empirical research generally examines the harmony of accounting practices by comparing if firms in different countries adopt similar policies. Otherwise, instead of comparing the accounting methods used by firms in different countries, Peill (2000) gather sample firms by industry type and then compare harmony levels across industries. The study analyzes seven accounting measurement practices (goodwill, inventory costing, fixed assets, foreign currency translation, deferred taxation, and consolidation methods) of firms from EU-12 Member States, for the years 1987 to 1997. To measure the degree of harmony, Peill (2000) adopt two methods: the chi-square test, and the I index. Largely, results suggest a substantially higher harmonization among international industries, than at the country level.

Since then, consistent with the assumption that industry background is a significant determinant in explaining accounting policy choice and disclosure, empirical research conducted by Rahman *et al*. (2002), Jaafar and McLeay (2007), and Jones and Finley (2011) confirm that the level of practice harmony is not independent of industry.

Also, when investigating the institutional determinants of corporate environmental and social disclosures in sixteen European countries, although not intending to directly test accounting harmony, Jackson and Apostolakou (2010) remark that harmony is likely to occur at industry level, since sector-level institutions may be very important in explaining the diffusion of minimum standards for corporate social responsibility. After all, firms operating in the same industry face common legitimization challenges, are affected by similar sectorial regulations, and tend to imitate competitors' behavior either at national or international level.

4.4.3. Foreign listing and international activity

Internationalization and level of voluntary disclosure

A process of internationalization takes place when a firm operates in, or depends upon, foreign markets (Tarca, 2004; Bansal, 2005). So, irrespective of the location of facilities, internationalization can occur through the capital markets, according to the firm's listing status, or, through the markets of products and services rendered by each firm, according to the geographical location of its customers.

In general, literature suggests that firms acting globally are deemed to disclose more information due to the increased complexity of operations and organizational structure, the larger number of rules and regulations to observe, and the dependency on the approval of a broader and diverse range of stakeholders. Notwithstanding, prior research on the association between internationalization and voluntary environmental disclosure shows contrasting results (refer to Table 4-4).

Table 4-4: Previous empirical evidence on the association between international activity, foreign listing, and level of voluntary environmental disclosure

Positive association between international activity/foreign listing and level of VED			
	Author(s)	Sample	Period
Proven	Stanny and Eli (2008)	US S&P 500 firms	2007
	Stanny (2013)	US S&P 500 firms	2006-2008
Not proven	Fekrat *et al.* (1996)	168 firms from 18 countries	1991
	Branco and Rodrigues (2008)	43 Portuguese firms	AR03/Web04
	Reverte (2009)	46 Spanish firms	2005-2006
	Jackson and Apostolakou (2010)	274 firms from 16 European countries	2007

Not proven: mixed results, contrary signal or not statistically significant association ($p>0,05$).

When examining social responsibility disclosure by 43 Portuguese listed firms, Branco and Rodrigues (2008) introduce "international experience", measured by the percentage of sales outside Portugal to total sales, as a determinant of disclosure. However, results suggest a non-significant relation between disclosure and international sales.

On the other hand, when analyzing the determinants of social responsibility disclosure by 46 Spanish listed firms, Reverte (2009) uses international listing, measured by the number of foreign stock exchanges in which the firm is listed, as an explanatory variable. Findings suggest that, although sample firms disclosing more information are listed on a higher number of foreign stock markets, the difference is not statistically

significant (at a 5% level) when comparing the group of firms with a disclosure rating higher than the median with firms disclosing lower than the median.

In a multi-country context, when investigating the institutional determinants of corporate environmental and social disclosures in sixteen European countries, Jackson and Apostolakou (2010) initially included in the analysis the percentage of foreign sales to total sales as well as foreign assets as a proportion of total assets. However, none of the two variables proved to be a significant determinant of disclosure. The authors offer as a plausible reason that most of the sample firms were highly internationalized showing therefore a low degree of variability. Hence, Jackson and Apostolakou (2010, p. 380) assume that the existing sample of firms did not allow a strong empirical test, and choose not to include those variables in their final results.

With regard to corporate disclosure on GHG emissions, when examining factors associated with disclosure by a sample of US S&P 500 firms, in 2007, Stanny and Eli (2008) consider that US firms that conduct business in countries that have ratified the Kyoto Protocol will be subject to increased scrutiny, and because most of the industrialized countries except the US ratified the Kyoto Protocol, the authors predict that firms with higher foreign sales face a higher climate risk and will therefore be more likely to deliver information on this issue. Results support this hypothesis, suggesting that US firms subject to more scrutiny because of their foreign sales are more likely to respond to the Carbon Disclosure Project questionnaire.

Likewise, when analyzing disclosure on GHG emissions by a sample of US S&P 500 firms, for the years 2006 to 2008, Stanny (2013) uses the level of foreign operations, measured by the percentage of international sales to total sales, as a control variable. The author predicts that firms with higher levels of domestic operations compared to foreign operations are less likely to be subject to foreign GHG regulations, and therefore less probable to have a GHG measurement system in place. Results do confirm this hypothesis, suggesting that the disclosing firms are more likely to have a higher percentage of international sales.

Internationalization and de facto accounting harmony of voluntary disclosure

Although international activity and foreign listing may be associated with more disclosure, the internationalization of firms is pointed out in literature as a possible driver of voluntary harmonization, on the grounds that firms acting internationally tend to adopt accounting policies that improve communication with users in several countries. In that extent, additional disclosure may not imply greater dissimilarity of information if firms converge to best disclosure practices to legitimize their activities in front of a global audience. On view of this, authors like Meek and Saudagaran (1990), Emenyonu (1993), Thorell and Whittington (1994), Cairns (1997), and Meek and Thomas (2004) discuss whether multinational firms, supposedly aimed at improving communication with users in several countries, may be one of the motivating factors for international accounting harmonization. However, empirical studies on this subject offer contrary evidence (e.g., Emenyonu and Gray, 1992, 1996; Emenyonu, 1993; Gray *et al*., 1995b; Emenyonu and Adhikari, 1998; Cañibano and Mora, 2000; Khanna *et al*., 2004; Jaafar and McLeay, 2007; Jackson and Apostolakou, 2010).

Considering that internationalization of capital markets provides a reason for global accounting harmony, Emenyonu (1993) examines if 413 large listed firms, from five leading economies (France, Germany, Japan, UK, US) differ in the use and disclosure of measurement accounting policies, for the 1990/91 financial year. After dividing the sample into multi-listed and domestic listed firms, and calculate the I index to quantify the level of harmony, Emenyonu (1993) concludes that the differences between the practices of multi-listed and domestic listed firms are minor.

On the other hand, focused on the harmony of accounting measurement practices in 1989 annual reports of 78 large firms from France, Germany and UK, Emenyonu and Gray (1992) notice significant differences between countries in respect of all the practices evaluated, being that the I index, used to quantify harmony, reveals a range of low values. Later, Emenyonu and Gray (1996) examine the extent to which the accounting measurement and associated disclosure practices of 293 large listed firms based in five developed stock market countries (France, Germany, Japan, UK, US) have become more harmonized internationally. Considering the changes occurred over the 20 year period from 1971/72 to 1991/92, Emenyonu and Gray (1996, p. 278) conclude that

progress has been quite modest and international accounting harmonization has remained an "elusive goal". Similar conclusions were presented by Emenyonu and Adhikari (1998) when evaluating harmony in selected accounting measurement practices of large firms from France, Germany, Japan, UK, and US, for the 1990/91 financial year.

However, authors such as Gray *et al*. (1995b), Cañibano and Mora (2000), Land and Lang (2002), and Khanna *et al*. (2004) suggest that firms operating internationally may be involved in a process of spontaneous harmonization, since *de facto* (material) accounting harmonization appears to occur among them despite the existing gaps in *de jure* (formal) accounting harmonization at international level.

In particular, with the intent to evaluate if there has been greater harmony in the accounting practices of firms operating globally, over the five-year period from 1991/2 to 1996/7, Cañibano and Mora (2000) examine annual reports of 85 firms whose shares were traded internationally (global players). The firms were selected from 13 European countries (Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, UK), their financial statements were evaluated with regard to four items (deferred taxation, goodwill, leasing and foreign currency translation), and the C index was computed to measure the level of harmony. Cañibano and Mora (2000, p. 367) find a higher value for the C index in the second period, concluding that a "process of spontaneous harmonization of European 'global players' went on in the 1990s".

Finally, when examining harmonization of accounting policy choice, in the years of 1991, 1995 and 1999, for a sample of 706 firms from 13 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, UK), Jaafar and McLeay (2007) consider listing status as a predictor of financial reporting practices. Regression results corroborate that the exposure to international capital markets is a significant determinant of accounting policy choice across the EU-13 Member States. Therefore, findings suggest that accounting choices of multi-listed firms are likely to differ from those of the domestic listed firms. However, Jaafar and McLeay's (2007) research design does not allow further conclusions about the relative level of harmony within each group of firms.

4.4.4. Ownership concentration and foreign ownership

Ownership structure and level of voluntary disclosure

Authors like Archambault and Archambault (2003) also justify enhanced voluntary disclosure in multi-listed firms, by a probable relationship between foreign listing and ownership dispersion. In the extent that agency conflicts are more likely to occur in firms with more dispersed ownership, literature identify ownership structure as a determinant of a firm's disclosure policy, being that in a widely held firm, voluntary disclosure can act as a tool to reduce agency costs (Jensen and Meckling, 1976). Accordingly, empirical research suggests that ownership dispersion across many shareholders contributes to increased pressure for voluntary disclosure (Ullmann, 1985), and, in order to reduce information asymmetry, widely held firms are expected to disclose more information than firms with concentrated ownership (Prencipe, 2004). With this in mind, Archambault and Archambault (2003, p. 181) argue that multi-listed firms are more like to produce additional disclosure, as ownership dispersion is likely to increase with the number of stock exchanges on which a firm is listed.

Literature also predicts that the relationship between internationalization and voluntary disclosure is conditioned by the legal environment in a firm's home-country. When examining the effects of internationalization and legal environment on voluntary disclosure practices of 643 non-US multinational firms from 30 countries (of which 11 belong to the EU-15), Webb *et al*. (2008) provide evidence that the effects of internationalization are most pronounced for firms from weak legal environments (code-law countries). The rationale is that internationalization can increase the benefits of disclosure by exposing firms from weaker legal environments to new markets where disclosure is more highly valued. When those firms start to operate in foreign markets, where their disclosures are likely to be regarded as less credible, they need to provide enhanced information to build trust and to improve their reputation.

With regard to environmental information, although not directly testing the association between foreign ownership and disclosure, authors such as Fekrat *et al*. (1996), and Gamble *et al*. (1996) notice differences in the nature of the environmental disclosure, depending on the firm's country of ultimate ownership. On this regard, Gamble *et al*.

(1996, p. 314) document that the nationality of the parent company affects both the extent and the content of its subsidiaries' environmental disclosures, being that firms domiciled in a country with high level of "social conscience and/or developed capital markets" tend to provide more voluntary disclosure. However, since then, empirical research on this area provides contrary evidence (refer to Table 4-5).

Table 4-5: Previous empirical evidence on the association between ownership concentration, foreign ownership, and level of voluntary environmental disclosure

PANEL A: Negative association between ownership concentration and level of VED			
	Author(s)	Sample	Period
Proven	Patten (1992)	21 US firms	1989
	Cormier and Magnan (1999)	33 Canadian firms	1986-1993
	Cormier and Gordon (2001)	3 Canadian electric utility firms	1985-1996
	Cormier and Magnan (2003)	50 French firms	1992-1997
	Brammer and Pavelin (2006)	447 UK firms	2000
	Brammer and Pavelin (2008)	447 UK firms	2000
Not proven	Roberts (1992)	130 US firms	1981-1986
	Halme and Huse (1997)	140 firms from 4 European countries	1992
	Cormier *et al*. (2005)	76 German firms	1992-1998
	Aerts *et al*. (2008)	682 firms from Europe, North America	2002
PANEL B: Positive association between foreign ownership and level of VED			
	Author(s)	Sample	Period
Proven	Moneva and Llena (2000)	70 Spanish firms	1992-1994
	Cormier and Magnan (2003)	50 French firms	1992-1997
Not proven	Archel (2003)	68 Spanish firms	1994-1998
	Cormier *et al*. (2005)	76 German firms	1992-1998
	Da Silva M. and Aibar-G. (2010)	43 Portuguese firms	AR03/Web04

Not proven: mixed results, contrary signal or not statistically significant association (p>0,05).

When analyzing the environmental reporting practices, from 1992 to 1994, in the annual reports of 160 firms operating in Spain, Moneva and Llena (2000) find no global differences between the environmental information disclosed by firms with a Spanish parent company and those with a foreign parent company. Nevertheless, over the research period, in some particular areas, such as quantitative and financial information, as well as disclosure of environmental expenses and investments, firms with a foreign parent company disclosed more than other sample firms. So, the authors conclude that there is evidence that a firm with a foreign parent provides more quantitative environmental information, possibly due to the circumstances (e.g., institutional framework) in the parent company's home-country. In contrast, when analyzing environmental disclosures made in the annual reports, from 2002 to 2004, by a sample of 109 firms operating in Portugal, da Silva Monteiro and Aibar-Guzmán (2010) find no

statistically significant differences between the level of environmental information disclosed by sample firms with a foreign parent company and the domestically owned firms.

On the other hand, considering that information costs incurred by a firm's shareholders are likely to enhance the extent of its environmental disclosure, Cormier *et al*. (2005) use both foreign ownership and concentrated ownership as explanatory variables, when analyzing environmental disclosure, from 1992 to 1998, among a sample of 55 German firms. With regard to concentrated ownership, the authors predict a negative relation with environmental disclosure, and results confirm that firms with concentrated ownership are significantly less likely to make voluntary environmental disclosures. Similar findings are presented by authors such as Patten (1992), Cormier and Magnan (1999, 2003), Cormier and Gordon (2001), and Brammer and Pavelin (2006, 2008). Concerning foreign ownership, Cormier *et al*. (2005) made no directional predictions. Often, literature admits a positive relation between foreign ownership and the extent of environmental disclosure. However, Cormier *et al*. (2005) claim that, since environmental concerns are higher in Germany than in many other countries, a negative relationship may also be expected. Actually, Cormier *et al*. (2005) find a significant negative association between foreign ownership and level of disclosure.

Finally, although not directly testing foreign ownership, Freedman and Jaggi (2005, 2011) analyze disclosure on GHG emissions, in 2000, by firms domiciled in countries that have ratified the Kyoto Protocol compared to others. The authors conclude that multinational firms that operate in countries that ratified the Protocol, but have their home offices in countries that did not, are associated with lower disclosure. That is, even though firms from non-ratifying countries are required to meet the Protocol's demands if they operate in Protocol ratifying countries, evidence suggests that they do not release detailed information voluntarily. In view of this, Freedman and Jaggi (2005, pp. 228-229) remark that "...even the most sophisticated users of financial statements are not likely to have a proper understanding of the impact of global warming on the firm's performance. In order to improve pollution disclosures for investment decisions, lack of voluntarism may lead regulators to consider mandatory disclosure requirements".

Ownership structure and de facto accounting harmony of voluntary disclosure

With regard to *de facto* (material) accounting harmony, when examining a sample of 146 Australian and New Zealand firms, in 1993, Rahman *et al*. (2002) predict a positive association between ownership concentration and accounting disclosure harmony. Based on accounting disclosure literature, the authors argue that firms with lower shareholder concentration are deemed to disclose more, and therefore it is expected that they have greater variability of information in comparison with firms with higher concentrated ownership structure. Results display a positive association between ownership concentration and harmony of voluntary disclosure, only at a 10% significance level.

Overall, further investigation is needed for a better understanding of the effects of firms' internationalization over the harmony in, and the level of accounting disclosure, under no mandatory guidance. Present research aims at shedding light on this matter.

4.4.5. Financial condition

Financial condition and level of voluntary disclosure

Other firm-specific characteristics such as profitability and financial leverage are also commonly investigated. However, literature shows contrary results on their association with voluntary environmental disclosure (refer to Table 4-6).

As regards profitability, authors like Deegan and Gordon (1996), Cormier and Magnan (1999), and Stanny and Eli (2008) find a positive relationship between environmental disclosure and financial performance. A common argument in favor of this hypothesis is that profitable firms are more exposed to political pressure and public scrutiny, and therefore they are supposed to use more voluntary disclosure in order to decrease political costs and to avoid further regulation (Reid and Toffel, 2009; Stanny and Ely, 2008). Concurrently, according to signaling theory, more profitable firms have incentives to use voluntary disclosure to distinguish themselves from less lucrative firms in order to raise capital on the best available terms (Cormier and Magnan, 1999, 2003). So, more profitable firms can be expected to voluntarily disclose more accounting information.

Table 4-6: Previous empirical evidence on the association between profitability, leverage and level of voluntary environmental disclosure

PANEL A: Positive association between profitability and level of VED			
	Author(s)	Sample	Period
Proven	Roberts (1992)	130 US firms	1981-1986
	Deegan and Gordon (1996)	197 Australian firms	1980-1991
	Cormier and Magnan (1999)	33 Canadian firms	1986-1993
	Stanny and Eli (2008)	US S&P 500 firms	2007
Not proven	Cowen *et al*. (1987)	US Fortune 500 firms	1978
	Belkaoui and Karpik (1989)	23 US firms	1973
	Hackston and Milne (1996)	47 New Zealand firms	1992
	Moneva and Llena (1996)	47 Spanish firms	1992
	Neu *et al*. (1998)	330 Canadian firms	1982-1991
	Archel and Lizarraga (2001)	56 Spanish firms	1995-1998
	Patten (2002)	131 US firms	1990
	Archel (2003)	68 Spanish firms	1994-1998
	Cormier and Magnan (2003)	50 French firms	1992-1997
	García-Ayuso and Larrinaga (2003)	112 Spanish firms	1991-1995
	Elijido-Ten (2004)	40 Malaysian firms	1999-2001
	Cormier *et al*. (2005)	76 German firms	1992-1998
	Freedman and Jaggi (2005)	120 firms from Europe, America, Asia	2000-2002
	Brammer and Pavelin (2006)	447 UK firms	2000
	Aerts *et al*. (2008)	682 firms from Europe, North America	2002
	Brammer and Pavelin (2008)	447 UK firms	2000
	Branco and Rodrigues (2008)	43 Portuguese firms	AR03/Web04
	Aerts and Cormier (2009)	158 US and Canadian firms	2002
	Reverte (2009)	46 Spanish firms	2005-2006
	Jackson and Apostolakou (2010)	274 firms from 16 European countries	2007
	Da Silva M. and Aibar-G.(2010)	109 Portuguese firms	2002-2004
	Mahadeo *et al*. (2011)	165 firms from Mauritius Island	2004-2007
	Faisal *et al*. (2012)	541 firms from 24 countries	2009
	Rupley *et al*. (2012)	127 US firms	2000-2005
	Salama *et al*. (2012)	169 US firms	1999
	Choi *et al*. (2013)	100 Australian firms	2006-2008
PANEL B: Negative association between financial leverage and level of VED			
	Author(s)	Sample	Period
Proven	Belkaoui and Karpik (1989)	23 US firms	1973
	Cormier and Magnan (1999)	33 Canadian firms	1986-1993
	Cormier and Magnan (2003)	50 French firms	1992-1997
	Brammer and Pavelin (2006)	447 UK firms	2000
Not proven	Roberts (1992)	130 US firms	1981-1986
	Archel and Lizarraga (2001)	56 Spanish firms	1995-1998
	Elijido-Ten (2004)	40 Malaysian firms	1999-2001
	Cormier *et al*. (2005)	76 German firms	1992-1998
	Freedman and Jaggi (2005)	120 firms from Europe, America, Asia	2000-2002
	Aerts *et al*. (2008)	682 firms from Europe, North America	2002
	Branco and Rodrigues (2008)	43 Portuguese firms	AR03/Web04
	Brammer and Pavelin (2008)	447 UK firms	2000
	Aerts and Cormier (2009)	158 US and Canadian firms	2002
	Reverte (2009)	46 Spanish firms	2005-2006
	Mahadeo *et al*. (2011)	165 firms from Mauritius Island	2004-2007
	Faisal *et al*. (2012)	541 firms from 24 countries	2009
	Choi *et al*. (2013)	100 Australian firms	2006-2008

Not proven: mixed results, contrary signal or not statistically significant association (p>0,05).

Likewise, in the context of the agency and political cost theories, Ness and Mirza (1991) points out that management in very profitable firms is likely to provide more detailed information in order to support their own position and compensation. In this regard, using return on assets as a proxy of bonus plan, Setyorini and Ishak (2012) confirm that, all else equal, environmental disclosure increases when the degree of firms' bonus plan increases.

Literature also suggests that it might simply be that profitable firms have the necessary economic means to produce additional disclosure. Authors like Hackston and Milne (1996), and Pirsch *et al*. (2007) argue that high earning rates allow managers enough ability to move funds towards environmental programs what could explain a positive association between profitability and environmental policy and disclosure. In reverse, in firms with less economic resources, managers probably will be more focused on activities that have a more immediate effect on profit rather than on the production of voluntary disclosure (Ullmann, 1985; Roberts, 1992).

However, most of prior empirical studies do not identify profitability as a significant determinant of voluntary environmental disclosure (Table 4-6 | Panel A).

In general, research on the association between financial performance and environmental disclosure has been inconclusive as to whether the relationship is positive, negative or even neutral. In view of this, authors like Roberts (1992) suggest that corporate social responsibility disclosure might be related to lagged profits, while Al-Tuwaijri *et al*. (2004) advance that prior literature's mixed results (when describing the interrelations between environmental disclosure, environmental performance, and economic performance) may be due to the fact that researchers have not considered these functions to be jointly determined. Then, based on a simultaneous equations models approach, Al-Tuwaijri *et al*. (2004) conclude that good environmental performance is significantly associated with good economic performance, and also with more extensive quantifiable environmental disclosure.

Differently, Neu *et al*. (1998) point out that, from a legitimacy theory perspective, profitability can be regarded to be either positively or negatively related to environmental disclosure. On one hand, in profitable periods, environmental disclosures

would aim at convince those stakeholders with environmental concerns that the firm's profit has not been at the expense of the environment. On the other hand, in less profitable periods, environmental disclosures would aim at either distracting attention from the weak financial results or convincing financial stakeholders that current environmental investments will result in long-term benefits.

With regard to GHG emissions, when examining voluntary information in annual reports and sustainability reports of 100 Australian firms, from 2006 to 2008, Choi *et al*. (2013) do not find a significant association between profitability, measured by return on assets, and level of disclosure. In a multi-country context, focusing disclosures, in 2000, by 120 firms domiciled in Europe, Asia, and North and South America, Freedman and Jaggi (2005) reach similar results.

Concerning to financial leverage, within the context of the agency theory, Jensen and Meckling (1976) argue that more highly leveraged firms are more likely to disclose voluntary information in order to reduce their agency costs and, as a result, their cost of capital. Thus, voluntary disclosures can be expected to increase with leverage. In contrast, Ball (1995) suggests that the association will be negative. Based on the signaling literature, the author argues that financing through equity requires greater disclosure than financing through debt, as it requires more dissemination of information. As a consequence, firms having higher debt would be disclosing less information in terms of both amount and variety.

Although some studies confirm a negative association between leverage and level of voluntary environmental disclosure, vast majority shows mixed results or non-significant association (refer to Table 4-6 | Panel B). Facing this lack of conclusiveness, authors like Branco and Rodrigues (2008), and Aerts and Cormier (2009) test the relationship without making any a priori assumption about the sign. Otherwise, Brammer and Pavelin (2006) predict a negative association between leverage and environmental disclosure, sustaining that a low degree of leverage ensures that creditor stakeholders will exert less pressure over management to restrain social and environmental activities that are not perceived as directly enhancing firms' financial performance. When analyzing a sample of UK firms, Brammer and Pavelin (2006) confirm this assumption. Later, when conducting a study over a similar sample of UK

firms, Brammer and Pavelin (2008) introduce a one-year lag between the dependent and independent variables, but regression results show no significant association between leverage and environmental disclosure.

On the other hand, when analyzing environmental disclosure by Canadian (Cormier and Magnan, 1999) or French firms (Cormier and Magnan, 2003), the authors predict that firms in good financial condition will choose to disclose more than firms in poor financial condition (measured by return on assets and leverage). In particular, Cormier and Magnan (1999, 2003) assume that for highly indebted firms the disclosure of prospective environmental liabilities conveys probable future costs, leading to concerns from their creditors about firm's performance. In contrast, the release of such information by firms in good financial condition can signal that they are well prepared to face environmental obligations and are willing to do so. As regards profitability, Cormier and Magnan (1999, 2003) show contrary evidence, but for leverage both studies support a negative association with disclosure.

Notwithstanding, in a multi-country context, when examining environmental disclosure by firms domiciled in Europe (Belgium, France, Germany, Netherlands) and North America (Canada, US), in 2002, Aerts *et al*. (2008) hypothesized that, since environmental disclosure may allow investors to better assess a firm's overall financial obligations, additional information may actually weaken a firm's stock market position if it is already highly indebted. Hence, the authors predict a negative relation between leverage and environmental disclosure. However, regression results show a non-significant association.

With regard to disclosure on GHG emission, when studying voluntary information in annual reports and sustainability reports of 100 Australian firms, from 2006 to 2008, Choi *et al*. (2013) do not find a significant association between leverage and level of disclosure. In a multi-country context, focusing GHG emission disclosure, in 2000, by 120 firms domiciled in Europe, Asia, and North and South America, Freedman and Jaggi (2005) present similar results.

Financial condition and de facto accounting harmony of voluntary disclosure

Authors such as Dong and Stettler (2011, p. 293) suggest that prior literature does not allow to formulate a priori assumptions about the sign or the association between financial condition (profitability, leverage) and the level of voluntary disclosure, neither predict its relationship with harmony of accounting practices. In the same line, Rahman *et al*. (2002), and Jaafar and McLeay (2007) do not include any profitability measure when analyzing accounting practice harmony.

However, as regards leverage, when examining a sample of 146 Australian and New Zealand firms, in 1993, Rahman *et al*. (2002) hypothesized that firms having higher equity would be disclosing more information, and as a result a greater variety of disclosure is expected when financing through equity is higher in comparison to financing through debt. So, the authors predict that leverage is positively associated with the level of practice harmony. However, Rahman *et al*. (2002) find a wrong signal non-significant association between leverage and harmony of voluntary disclosure, not confirming their prediction.

Final synthesis

Next table summarizes main results from prior research on the association between firm-specific characteristics and either the level of voluntary environmental disclosure or *de facto* (material) accounting harmony in voluntary disclosure.

Table 4-7: Synthesis of previous empirical evidence on the association between firm-specific characteristics and level of voluntary environmental disclosure or *de facto* accounting harmony in voluntary disclosure

	Level of voluntary environmental disclosure			**Harmony in voluntary disclosure**		
Firm-specific characteristics	Predicted Association	Predicted sign	Results	Predicted Association	Predicted sign	Results
Size	Yes	+	√	Yes	-	√
Industry affiliation ESI	Yes	+	√	Yes	None	√
Internationalization	Yes	+/-	Mixed	Yes	-/+	Mixed
Ownership concentration	Yes	-	Mixed	Yes	+	Not proven
Foreign ownership	Yes	+/-	Mixed	---	---	---
Profitability	Yes	+/-	Mixed	---	---	---
Leverage	Yes	-/+	Mixed	Yes	+	Not proven

√ Results generally confirm association and predicted sign at least for p<0,05.
ESI - Environmental sensitive industries.

5. Evaluating the "disciplinarian effect" of standards and markets on the level of carbon financial disclosure

This chapter provides empirical evidence on the effects of regulatory background, affiliation in carbon intensive industries, and international exposure, over the level of carbon financial disclosure, addressing in particular if the type of guidance in home country acts as moderator of firm-level relationships between internationalization and level of disclosure.

5.1. Introduction

As discussed in previous chapter, determinants of corporate disclosure encompass regulatory background, and firm-specific characteristics such as the affiliation in industries with high environmental impact or the exposure to international markets.

With regard to regulatory background, literature suggests that management uses discretion not only under unregulated contexts but also when facing mandatory guidance on disclosure items. However, limited attention has been given in past research to analyze disclosure under mandatory regimes. In the present study, the issuance of mandatory guidance on accounting for GHG emission allowances, for firms linked to the Spanish allowances allocation plan, allows the analysis of disclosure in response to both mandatory and non-mandatory guidance, expanding prior research.

Beside regulatory influences, firm-specific characteristics such as affiliation in industries with high environmental impact, and international activity are single out in literature as putting additional pressure on firms to provide more environmental information. Notwithstanding, prior research shows mixed results when dealing with the internationalization of firms. The present investigation intends to reassess the association between internationalization and environmental disclosure, both in regulated and unregulated contexts.

Overall, the aim of this study is to shed light on areas where previous investigation is scarce (disclosure under mandatory guidance) or showed mixed results (the relationship between internationalization and level of disclosure), focusing in particular the following research questions:

1. Does mandatory guidance lead to increased levels of disclosure on GHG emission allowances in the annual accounts?
2. Does mandatory guidance exert a "disciplinarian effect" both in the dissemination of qualitative information (*soft* disclosure) as well as quantitative information (*hard* disclosure) related to GHG emission allowances in the annual accounts?
3. Does national guidance, though not mandatory for entities under IFRS, exert a significant influence over disclosure practices on GHG emission allowances in the annual accounts of EU-15 firms applying IFRS?
4. Are firms operating in high carbon intensive and regulated industries more likely to provide further disclosure on GHG emission allowances in the annual accounts, than other firms?
5. Is internationalization a driver of disclosure? Can we rely on spontaneous movements among firms acting globally to enhance disclosure on GHG emission allowances in the annual accounts?

The remainder of this chapter is organized as follows. Section 5.2 formalizes hypotheses for investigation. Section 5.3 describes data and research methodology. The final section presents and discusses empirical results.

5.2. Hypotheses

The present study covers disclosure on GHG emission allowances in annual accounts of EU-15 listed firms under the following scenarios (described in section 2.2.2):

A. No specific guidance on how to report GHG emission allowances in the annual accounts (Denmark, Greece, Ireland, Italy, Luxembourg, Netherlands, Sweden, and United Kingdom).
B. Guidance in home-country on how to report GHG emission allowances in the annual accounts, though not mandatory for entities under IFRS, of which:
   B1. Without detailed guidelines on disclosure items (Austria, Belgium, France, and Germany).
   B2. With detailed guidelines on disclosure items (Finland, and Portugal).
C. Mandatory guidance in home-country on how to report GHG emission allowances in the annual accounts, with detailed guidelines on disclosure items (Spain).

As concerns voluntary disclosure, authors like da Silva Monteiro and Aibar-Guzmán (2010), and Choi *et al*. (2013) notice that non-mandatory guidance seems to have a positive effect on firms' decisions to voluntarily release environmental information in their annual reports. Concurrently, some strands of international accounting research suggest that domestic accounting standards in EU Member States, in spite of no longer applying for the consolidated statements of listed firms since 2005, may continue to affect their reporting practices (Nobes, 2006, 2008; Kvaal and Nobes, 2010; Barbu *et al*., 2014). In particular, when examining environmental disclosure by firms complying with IFRS, Barbu *et al*. (2014) identify the intensity of the environmental disclosure constraints in the country where the firm is located as a key factor to explain increased levels of environmental information in the annual reports.

In general, most of multi-country studies examining European firms under IFRS do not consider discrepancies among national accounting guidance. However, the evidence reported by Barbu *et al*. (2014) suggests that home-country guidance may be a relevant constraint to the process of *de facto* (material) accounting harmonization within EU. In the extent that national guidance, though not mandatory for entities under IFRS, continue to exert a significant influence on their disclosure practices, differences between countries are probable to remain, in spite of the compulsory use of IFRS for the consolidated statements of listed firms since 2005.

Nobes (2006) had already advanced several arguments (including inertia) explaining why the pre-IFRS dissimilarities are likely to have a significant effect on the reporting practices of EU firms applying IFRS. Building on prior investigation, this study predicts that, in the light of legitimacy theory and institutional theory, national guidance namely issued after 2005 and not applicable to firms under IFRS since then is expected to influence their disclosure practices, especially when dealing with issues not covered by IFRS, and not conflicting with them. According to legitimacy theory (Deegan, 2002; O'Donovan, 2002; Jackson and Apostolakou, 2010), firms under IFRS are compelled (by legitimacy-seeking behaviors) to reveal as much information as their competitors, including those applying local guidance. Concurrently, in line with institutional theory, when an organization anticipates that conformity with social expectations (even though set out by non-mandatory rules) will enhance social fitness, a process of voluntary

diffusion, through imitation, is more likely to occur, than under no guidance (Oliver, 1991). Therefore, higher levels of disclosure are expected among firms domiciled in countries where national guidance was issued, though not mandatory for entities under IFRS, than among firms domiciled in countries where no guidance on accounting for GHG emission allowances was provided. Accordingly, the following hypothesis is put forward:

H1: *The level of carbon financial disclosure is predicted to be higher among firms domiciled in countries where national guidance on accounting for GHG emission allowances was issued, though not mandatory for entities under IFRS, than among firms domiciled in countries where no specific guidance was provided.*

On the other hand, literature on mandatory disclosure suggests that regulations to be effective must be clearly delineated (Frost, 2007; Criado-Jiménez *et al*., 2008; Peters and Romi, 2013). Expanding prior research, this study assumes that, in the light of stakeholder theory and institutional theory, the same is likely to apply to non-mandatory guidance. The rationale is that, national guidance establishing detailed benchmarks for disclosure, though not mandatory, helps to inform the public opinion on disclosure best practices, and contributes to raise awareness among stakeholders about the relevant information to be provided in the annual accounts. Moreover, detailed benchmarks are likely to boost stakeholders' perception that lack of critical information may well correspond to bad news. As a consequence, detailed guidance, though not mandatory, is expected to exert pressure for additional disclosure by firms looking for stakeholders' approval, and not wanting to incur the costs of bad reputation. Accordingly, to test if not mandatory detailed guidance is an incentive for voluntary adoption of higher levels of carbon financial disclosure, the following hypothesis is put forward:

H2: *The level of carbon financial disclosure is predicted to be higher among firms domiciled in countries where national guidance on accounting for GHG emission allowances, though not mandatory for entities under IFRS, comprises detailed requests for disclosure, than among firms domiciled in countries where not mandatory guidance does not specify detailed requests for disclosure.*

As regards mandatory disclosure, previous research shows that, although not ensuring

full compliance, mandatory guidance enhances the level of environmental information (Larrinaga *et al*., 2002; Llena *et al.*, 2007; Criado-Jiménez *et al*., 2008; Acerete *et al*., 2011). In accordance with agency theory and proprietary costs theory (Dye, 1985; Diamond and Verrecchia, 1991), a firm's optimal level of disclosure is achieved when the marginal cost of disclosure is equal to its marginal benefit. As described by Seah and Tarca (2006), under mandatory guidance, costs of disclosure are likely to be greater because, to avoid possible penalties, more proprietary information is revealed which could damage a firm's wealth and reputation, and benefits of disclosure are potentially superior because compulsory information has more credibility namely when it is certified. So, under a mandatory regime, both the costs and the benefits of release potentially increase, changing the equilibrium point, and expanding the level of a firm's disclosure. Likewise, on view of stakeholder theory and institutional theory, mandatory guidance is likely to draw the attention of more powerful stakeholders, and therefore is a potential driver of further environmental information (Criado-Jiménez *et al*., 2008), being that when institutional pressures are enacted by means of legal regulations, the greater the likelihood of organizational acquiescence (Oliver, 1991). Therefore, to investigate whether higher levels of disclosure are more likely to occur under mandatory guidance on accounting for GHG emission allowances, than under no mandatory regime, the following hypothesis is put forward:

H3: *The level of carbon financial disclosure is predicted to be higher among firms under mandatory guidance on accounting for GHG emission allowances, than among firms under no mandatory regime.*

However, mandatory guidance does not prevent strategic withholding of environmental information (Barth *et al*., 1997; Larrinaga *et al.*, 2002; Mobus, 2005; Frost, 2007; Criado-Jiménez *et al*., 2008; Alexander *et al*., 2011; Peters and Romi, 2013). As suggested by Oliver (1991), the appearance of conformity rather than conformity itself is often sufficient for the attainment of legitimacy. In view of this, concealment tactics to manage an impression of compliance with regulations may well take the form of ritualism (Oliver, 1991), meaning that, in spite of growing levels of disclosure, firms fail to disclose those elements of regulations that are not consistent with the interests of their most powerful stakeholders (Adams *et al*., 1995; Neu *et al*., 1998; Larrinaga *et al*.,

2002; Llena *et al.*, 2007). In particular, under mandatory guidance, disclosure biased towards more good news and ritual information (rather than bad news and accurate information) is identified by Criado-Jiménez *et al*. (2008) as a strategy to manage the public impression of the environmental performance of the firm. Notwithstanding, prior evidence also suggests that, although not ensuring full compliance, mandatory guidance is more likely to cause a significant increase of disclosure, namely for those items that firms are less willing to reveal (Criado-Jiménez *et al*., 2008).

In general, past research on quality of discretionary disclosure or examining whether firms comply (or not) with the more demanding aspects of regulations, is based upon the distinction between *bad* news and *good* news (e.g., Deegan and Gordon, 1996; Criado-Jiménez *et al*., 2008) or *hard* disclosure and *soft* disclosure (e.g., Clarkson *et al*., 2008; Cormier *et al*., 2009).

Related literature defines *bad* news as information about activities having a negative impact on society or failures in attempts to overcome social problems, whereas *good* news represent information about corporate activities having a positive impact upon society (Deegan and Gordon, 1996, p. 63). As admitted by, amongst others, Bewley and Li (2000, p. 206), there is a great deal of subjectivity when classifying disclosure into good news and bad news, because ultimately the positive or negative nature of the information varies according the different perspectives of each group of stakeholders. For instance, costs incurred as a result of fines and penalties may be bad news to corporate environmental stakeholders "but be the least costly option for the firm given its present operations and financial condition. Hence, they could be 'good' news to shareholders" (Bewley and Li, 2000, p. 221). Also, capital expenditures for pollution control may be good news for environmental stakeholders, but may represent cash outflows with no expected economic benefit from shareholder's perspective.

Differently, Clarkson *et al*. (2008) distinguish between *hard* and *soft* disclosure[1]. *Hard* disclosure consists of objective and verifiable information that cannot be easily mimicked by poor environmental performers (quantitative-verifiable information),

[1] This distinction was first applied by Clarkson *et al*. (2008) to the items included in the Global Reporting Initiative (GRI) sustainability reporting guidelines, and then extended by other researchers (e.g., Cormier *et al*., 2009) to corporate social and environmental information disclosed in other reporting forms.

while *soft* disclosure comprises not easily verifiable claims to be committed to the environment (qualitative or declarative information). This division allows to evaluate the nature of disclosure avoiding the subjectivity of the classification into *good* news and *bad* news, pointed out by, amongst others, Bewley and Li (2000). In Clarkson *et al.*'s (2008) distinction the underlying assumption to evaluate disclosure is that quantitative information is more *objective*, *informative* and *credible* than qualitative information (Hutton *et al.*, 2003; Al-Tuwaijri *et al.*, 2004; Cho and Patten, 2007; Cormier *et al.*, 2009). On one hand, by revealing more precise and verifiable information, proprietary costs resulting from quantitative disclosure are likely to be higher than for qualitative disclosure, and to the extent that quantitative information is deemed to contain more proprietary information, investors may perceive quantitative information to be more *credible* (Cho and Patten, 2007; Cormier *et al.*, 2009). On the other hand, as it increases the ex-post verifiability of the information disclosed, quantitative disclosure is more *objective* and *informative* to stakeholders (Al-Tuwaijri *et al.*, 2004). Accordingly, the potential relevance and usefulness of quantitative information is generally perceived to be higher than that of qualitative disclosure (Aerts *et al.*, 2006).

Following Cormier *et al.* (2009), the present study adopts the distinction between qualitative (*soft*) disclosure and quantitative (*hard*) disclosure to test if, in spite of probable concealment strategies, mandatory guidance exerts a "disciplinarian effect" on the dissemination of more quantitative-verifiable (*objective*, *informative* and *credible*) information on GHG emission allowances in the annual accounts. Therefore, the following hypothesis is put forward:

H4: *The level of carbon financial disclosure on quantitative items is predicted to be higher among firms under mandatory guidance on accounting for GHG emission allowances, than among firms under no mandatory regime.*

As summarized in Figure 5-1, hypotheses H1 to H4 test the "disciplinarian effect" of accounting standards over the level of carbon financial disclosure, namely on *hard* news. Then, regulatory influences coming from industry affiliation are also investigated. As their activities are more likely to damage the environment, firms belonging to industries with high environmental impact face more strict regulations, are subject to

further scrutiny, and are predicted to have higher political costs. So, in accordance with Watts and Zimmerman's (1978, 1990) hypothesis, those firms are expected to provide more information in order to avoid pressure from governmental regulatory bodies, to reduce the possibility of adverse political actions by other pressure groups, and therefore to mitigate expected political costs. Also, from legitimacy theory standpoint, firms in more polluting activities are deemed to offer higher levels of environmental disclosure, given their greater need of legitimizing with society. Likewise, in the lens of institutional theory, firms in environmentally sensitive industries might have more to gain by voluntarily release environmental information and "…choosing themselves - in other words, controlling - the standards by which they have to comply rather than leave this responsibility to the state", as advanced by Jackson and Apostolakou (2010, p. 374).

In several EU countries, industries identified as the most polluting (chemical, electric utility, pulp & paper, metal industries) has been subject to national environmental programs requiring the disclosure of specific information since the mid 60's of last century (Halme and Huse, 1997, p. 142). As those firms are perceived as pollutants long ago, they have been motivated to disclose their environmental actions since then. As a result, they have created routines to collect and treat environmental information before others, being that the routine is a significant predictor of environmental disclosure, as pointed out by, amongst others, Al-Tuwaijri *et al*. (2004), Cormier *et al*. (2005), Aerts *et al*. (2006), Brouhle and Harrington (2009), and Stanny (2013).

With regard to industries covered by EU-ETS, the electricity sector is the most important both in terms of allowances granted and shortfall of allowances (Solier and Jouvet, 2011). In fact, the efficiency of EU-ETS in providing incentives for the transformation towards a low-carbon economy depends on whether CO2 costs may be passed through to electricity prices, or not (Reinaud, 2007; EC, 2012), because when producers pass-through those costs to electricity prices they transmit signals of carbon costs to the economy, in the line with EU-ETS' aim. For utility firms, CO2 is an additional cost component to electricity generation, whether allowances are granted for free or paid for, and economic theory states that in a competitive market the pass-through of CO2 prices in electricity prices is inevitable (Reinaud, 2007; EC, 2012). As a generator holds allowances, production of CO2-emitting electricity contends with the

possibility to sell the unused allowances. This opportunity cost of CO2 allowances equals the CO2 market price and is incorporated in producers' decisions to generate electricity. Whether, or not, the full opportunity cost of allowances is passed through electricity prices depends on several elements, including market structure, contractual arrangements between governments and power generators[2], and regulatory frameworks[3].

When examining disclosure of environmental liabilities by firms operating in environmentally sensitive and regulated industries, Bart *et al*. (1997) conclude that utility firms tend to disclose more information about their environmental liabilities, than other firms, because they ultimately pass these costs on to consumers through higher rates. In the same vein, authors such as Moneva and Llena (1996), Gao *et al*. (2005), Boesso and Kumar (2007), Brammer and Pavelin (2008), and Aerts and Cormier (2009) find evidence that firms in the utility sector tend to disclose more environmental information than other firms. More recently, research focused on GHG emission disclosure (Choi *et al*., 2013) suggests that firms operating in the most carbon intensive industries, including not only utilities, but also basic materials, transportation, and oil & gas (European Commission, 2003, 2009; Carbon Disclosure Project, 2006) are more likely to disclose information on GHG emissions. Hence, to investigate if the level of carbon financial disclosure tends to be higher among firms operating in more carbon intensive industries, the following hypothesis is put forward:

H5: *Ceteris paribus, the level of carbon financial disclosure is predicted to be higher among firms operating in more carbon intensive industries, than among other firms.*

Another determining factor sometimes pointed out in literature as enhancing corporate disclosure is the internationalization of firms.

[2] For instance, in Portugal different regimes coexist depending on kind and legal status of power generators. During EU-ETS' first period, with regard to power stations under the costs of maintaining contractual balance (CMEC - Centrais sob o regime dos custos de manutenção do equilíbrio contratual) it was established that CO2 costs will be paid by consumers. For power stations under market system, each producer was able to define its strategy and reflect, or not, the cost of CO2 in the electricity prices (ERSE, 2010, 2012). Since 2008, more specified regimes on pass-through carbon costs to consumers are stated in Decree No 11210/2008, of April 17, 2008, regarding the optimization of management mechanism of CO2 emission allowances.

[3] Across the EU there is no single electricity market, but several markets and several regulatory frameworks (for detail see EASAC, 2006).

With regard to the internationalization through capital markets, related literature suggests that foreign listing is a significant determinant of voluntary disclosure. From the agency theory standpoint, firms listed on foreign stock exchanges have greater agency costs, and as a result they are more likely to use additional disclosure to limit the monitoring and the agency costs resulting from the existence of a greater variety of shareholders. In particular, for foreign shareholders it may be difficult to obtain information about the firm from alternative sources. So, when a large portion of a firm's shareholders is foreign, it becomes efficient to increase environmental disclosure (e.g., Cormier and Magnan, 2003; Webb *et al*., 2008). In the same line, according to signaling theory and cost of capital theory, firms listed on foreign stock exchanges may expect that higher levels of disclosure are perceived as good signals by the market, being therefore motivated to release additional disclosure in order to reduce cost of capital, especially when depending on fund raising in foreign markets (e.g., Cooke, 1989, 1991; Meek and Gray, 1989; Aerts *et al*., 2008).

Also, related literature points out that multinational firms are deemed to disclose more information due to the larger number of rules and regulations to observe, the increased complexity of operations and organizational structure, and the dependency on the approval of a broader and diverse range of stakeholders. In particular, when examining factors influencing voluntary disclosure in the annual reports of US and European multinational corporations, Meek *et al*. (1995) notice that firms participating in international capital markets tend to disclose significantly more voluntary financial information, than firms registered only in domestic markets.

But even firms not listed in foreign stock exchanges may have incentives to disclose more if they operate internationally. The internationalization of firms' operations may enhance voluntary disclosure because, beyond the requests faced at domestic markets, firms have to deal with the pressure and the needs for further information of a wider range of stakeholders (foreign customers, suppliers, labor unions and governmental and non-governmental bodies). Beside, firms operating in more than one geographical area tend to have better managerial control systems because of the greater complexity of their operations. As a result, they are expected to prepare higher extent of disclosure (e.g., Zarzeski, 1996; Rahman *et al*., 2002; Cahan *et al*., 2005; Webb *et al*., 2008).

Notwithstanding, prior research on the association between internationalization and voluntary environmental disclosure shows contrasting results (Branco and Rodrigues, 2008; Stanny and Eli, 2008; Reverte, 2009; Jackson and Apostolakou, 2010; Stanny, 2013). In particular, authors such as Thorell and Whittington (1994), Cormier *et al*. (2005), and Jackson and Apostolakou (2010) advance that a positive or a negative relationship between internationalization and level of disclosure may be expected, namely depending on the relative degree of environmental awareness in home-country when compared with those foreign markets to which the firm is exposed.

To reassess the association between the exposure to foreign markets and the level of disclosure, this study considers internationalization through capital markets and through the markets of products and services where external customers are located, being the latter evaluated by the weighting of two different measures of international exposure: the intensity (percentage) of sales outside the country of domicile; and the variety (number) of markets where foreign customers are located.

As regards listing status, foreign listed firms in the sample are registered mainly in US stock exchanges, a country that did not ratified the Kyoto Protocol, and where, over the research period, there was a lack of specific accounting guidance on how to report GHG emissions in the annual accounts. Consequently, despite the exposure to a broader range of stakeholders, EU-15 firms listed abroad may not face additional pressures to enhance carbon financial disclosure, when compared with firms registered only in domestic markets. In these circumstances, a significant positive association between foreign listing and carbon financial disclosure would provide strong evidence of the existence of a spontaneous movement among firms participating in international capital markets to improve accounting practices, as suggested by Cañibano and Mora (2000), and Khanna *et al*. (2004). Accordingly, to test if internationalization through the capital markets exerts a strong "disciplinarian effect" over foreign-listed firms, enhancing the level of disclosure on GHG emission allowances in their annual accounts, irrespective of the regulatory background or environmental awareness in host countries, the following hypothesis is put forward:

H6: *Ceteris paribus, the level of carbon financial disclosure is predicted to be higher among foreign listed firms, than among firms listed only in domestic stock exchanges*.

Considering the internationalization through the markets of products and services where customers are located, a significant positive association between foreign sales and disclosure would provide strong evidence of the existence of a voluntary movement among firms operating internationally to improve communication with stakeholders.

However, according to institutional theory, the lack of international consensus regarding either the commitment to the Kyoto Protocol or the appropriate accounting model for emissions trading schemes, may not favor a process of voluntary release of carbon financial disclosure by EU-15 multinational firms. As predicted by Oliver (1991), when rules or norms are not broadly diffused or supported by society, organizations are less likely to respond to institutional pressures because their social validity is questioned, and, consequently, voluntary diffusion is less likely to occur. For EU-15 firms operating globally, international environment may be perceived as fragmented in the extent that values, norms and practices concerning the commitment to the Kyoto Protocol and the appropriate accounting model for emissions trading schemes are not broadly diffused or widely validated among host countries. So, international pressures may be seen as less convincing or weaker than domestic constraints, and the fragmentation of international environment may lead to *organizational skepticism* (Oliver, 1991, p. 159) about the strategic utility of carbon financial disclosure as a tool to manage a multiplicity of foreign stakeholders. Therefore, to investigate if internationalization through foreign sales exerts a strong "disciplinarian effect" over firms operating globally, by enhancing the level of disclosure on GHG emission allowances in their annual accounts, irrespective of the regulatory background or environmental awareness in host countries, the following hypothesis is put forward:

H7a: *Ceteris paribus, the level of carbon financial is predicted to be higher among firms with more exposure to foreign markets, than among firms operating mainly in domestic markets.*

On the other hand, in line with Webb *et al*. (2008), the effects of internationalization are expected to be more pronounced for EU-15 firms under no mandatory regime (when compared with firms under mandatory guidance), because those firms most probably face the scrutiny of foreign markets where carbon financial disclosure is more valued than in home-country.

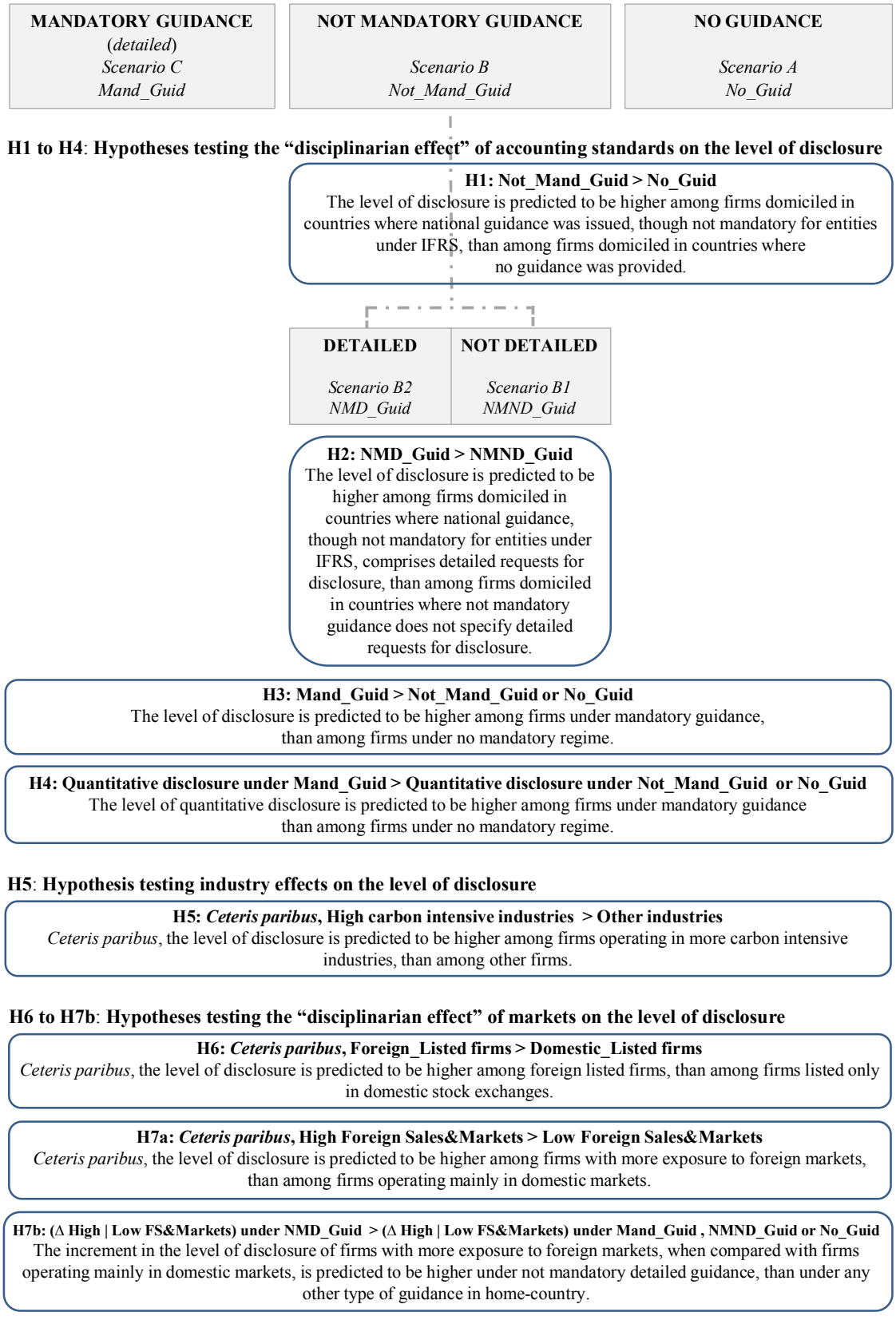
In particular, to improve reputation in external markets, firms with higher international exposure have more incentives to follow non-mandatory guidance in home-country, than firms operating mainly in domestic markets. Moreover, in accordance with stakeholder theory and institutional theory, by calling the public attention to the relevant information to be provided in the annual accounts, home-country guidance recommending clear benchmarks for disclosure, though non-mandatory, is more likely to put pressure for further information (Frost, 2007; Criado-Jiménez *et al*., 2008; Peters and Romi, 2013), namely on entities applying IFRS (Barbu *et al*., 2014). As a result, not mandatory detailed guidance is an incentive for the release of higher levels of disclosure, especially among those firms seeking to build trust in front of a broader range of stakeholders. Therefore, to investigate if non-mandatory guidance establishing detailed items for disclosure underpins a positive relationship between the degree of internationalization and the level of voluntary disclosure, the following hypothesis is put forward:

H7b: *The increment in the level of carbon financial disclosure among firms with more exposure to foreign markets, when compared with firms operating mainly in domestic markets, is predicted to be higher under not mandatory detailed guidance (scenario B2), than under any other type of guidance in home-country on how to report GHG emission allowances* (*scenarios* A | B1 | C).

Figure 5-1 summarizes the hypotheses (H1 to H7b) to test the existence of a "disciplinarian effect" of standards and markets over the level of carbon financial disclosure.

The analysis comprises, as control variables, firm's size, ownership concentration, profitability and leverage, on the grounds of being firm-specific characteristics usually pointed out in literature as significant predictors of voluntary disclosure (refer to section 4.4). Additionally, considering that national business systems are likely to affect firms' strategic choices, namely in the ways in which they communicate with stakeholders (Midttun *et al*., 2006; Freedman and Jaggi, 2005, 2011; Carnevale *et al*., 2012; Faisal *et al*., 2012), the influence of institutional environment in firms' home-country is also included in the analysis to check the robustness of results.

Figure 5-1: Synthesis of the hypotheses testing the "disciplinarian effect" of standards and markets on the level of carbon financial disclosure



5.3. Data and method

5.3.1. Sample

The initial working list of entities operating installations covered by EU-ETS was obtained from the EC Climate Action website[4]. The selected sample was then restricted to listed firms with registered address in those Member States (EU-15) that share a common agreement under the Kyoto Protocol to reduce GHG emissions. Firms were excluded when not covered by both the Supplementary Commitment Period (2005-2007), and the First Commitment Period (2008-2012) or when allowances initially allocated were revoked before the end of the correspondent trading period. Next table summarizes sample breakdown by country of domicile and by industry using the Industry Classification Benchmark (ICB) classification system.

Table 5-1: Sample breakdown by country of domicile and by industry

Industry / Country	Oil & Gas	Basic Materials	Industrials	Consumer Goods & Services	Utilities	Other	Total n	Total %
Austria	1	2	3	1	2	0	9	5,4
Belgium	0	4	2	1	0	1	8	4,7
Denmark	0	1	2	4	0	1	8	4,7
Finland	1	5	1	1	1	0	9	5,4
France	2	1	6	5	3	0	17	10,1
Germany	0	5	5	6	3	3	22	13,1
Greece	2	1	1	0	1	0	5	3,0
Ireland	0	0	1	2	0	1	4	2,4
Italy	3	0	5	4	4	0	16	9,5
Netherlands	1	3	3	2	0	0	9	5,4
Portugal	1	1	4	0	1	0	7	4,2
Spain	2	10	7	1	2	0	22	13,1
Sweden	0	5	4	3	0	0	12	7,1
United Kingdom	3	2	2	6	3	4	20	11,9
Total n	16	40	46	36	20	10	168	
Total %	9,5	23,8	27,4	21,4	11,9	6,0		100,0

As described in Annex I, final sample comprises 168 listed firms from fourteen EU countries, being that in Luxembourg no firm has fulfilled the selection criteria. The research covers an eight-year period, from 2005 to 2012, amounting to 1 344 firm-year observations. The selection of the beginning period has been due to the start of the first trading period of EU-ETS in 2005.

For the purpose of confirming the existence of a "disciplinarian effect" of accounting standards, sample firms were classified according to the type of formal guidance in home-country (no guidance, not mandatory guidance, mandatory guidance), and the

[4] http://ec.europa.eu/clima/policies/ets/index_en.htm. Last accessed on 19 July 2014.

type of requests on disclosure items (detailed versus not detailed), arriving at four categories (no guidance, not-mandatory not-detailed guidance, not-mandatory detailed guidance, and mandatory (detailed) guidance), as summarized in the next table.

Table 5-2: Sample breakdown by type of guidance in home-country

Type of guidance (2005-2012)	Country	Firm-year observations	
		N	%
No Guidance	Denmark, Greece, Ireland, Italy, Netherlands, Sweden, UK	592	44,0
Not Mandatory	Austria, Belgium, Finland, France, Germany, Portugal	576	42,9
of which:			
Not Mandatory Not Detailed	*Austria, Belgium, France, Germany*	*448*	*77,8*
Not Mandatory Detailed	*Finland, Portugal*	*128*	*22,2*
Mandatory (detailed)	Spain	176	13,1
Total		**1 344**	**100,0**

Additionally, for the purpose of testing the existence of a "disciplinarian effect" of markets, sample firms were labelled according two dimensions: entities acting internationally (i) through the stock markets, according to the firm's listing status; or, (ii) through the markets of products and services rendered by each firm, according to the geographical location of its customers.

Concerning the listing status, firms whose shares were listed in more than one stock exchange, the domestic and at least one foreign stock market, were classified as foreign listed firms, irrespective of their percentage of sales to foreign markets, as described in Tables 5-6 and 5-7. Regarding the internationalization through the markets of products and services, firms were evaluated according both the intensity of sales outside the country of domicile and the variety of markets where foreign customers are located. This procedure intends to overcome the fact that the percentage of foreign sales does not capture, by itself, the diversity of markets to which the firms is exposed. So, the level of internationalization was assigned through a composite measure weighting the percentage of sales to foreign markets by the relative number of foreign reportable geographical segments, for each firm, arriving at variable *Foreign Sales & Markets* described in Tables 5-6 and 5-7.

5.3.2. Data collection

Data, from 2005 to 2012, was hand-collected from firms' websites and stock exchanges' websites. Annual reports were downloaded directly from firms' websites. Each firm's annual report was read, and data concerning to its accounting policy choice, as well as attached disclosure in other explanatory notes on GHG emission allowances, were collected in order to compute a disclosure index for each year under review.

The percentage of sales to foreign markets and the number of geographical segments were computed from the disclosure note on "operating segments" in the financial statements, assuming as foreign all markets outside the country in which the firm is registered.

Regarding to geographical segments, the number of segments reported by each firm was first collected. Then, considering that for some firms the reporting units for geographical segments are continents or regions while other firms report on a country-by-country basis, an adjusted measure was adopted to assure consistency in evaluating the exposure to different foreign markets. The adjustment consisted in reclassifying the segments reported by each firm according to the following categories: 0) country of firm's domicile; 1) other European countries; 2) America; 3) Africa; 4) Asia; and 5) Rest of the World. It should be noted that a finer discrimination would be of interest. However, firms' annual reports do not provide further detailed comparable information on this matter.

Also, total assets, total debt, turnover, and net profit were collected in order to evaluate firms' size, profitability and leverage. When the reporting currency unit was not the euro, the conversion was made by applying the relevant exchange rates at the balance sheet date.

Finally, industrial sector classification, listing status, and ownership structure were assessed through "company profile" provided either in stock exchange websites or firms' websites, and checked in the annual reports as needed.

5.3.3. Data analysis

The aim of the analysis is to examine the effect of firm-level and country-level explanatory variables on carbon financial disclosure, and to test if the explanatory variables at the country-level (type of guidance) serve as moderators of the firm-level relationships between the degree of internationalization and the level of disclosure. As described earlier, the sample consists of repeated observations, over the course of eight years, for 168 firms domiciled in fourteen EU countries, featuring a structure that is commonly known in literature as a multilevel or hierarchical structure. In view of this, multilevel (hierarchical) models were estimated to test the hypotheses formulated earlier in section 5.2.

In past research, multistage data were often examined using conventional multiple regression analysis[5] with a dependent variable measured at the firm-level and a set of predictors from different levels of analysis (e.g., firm-level and country-level explanatory variables). However, treating all available data at one single stage, suffers from conceptual and statistical problems as discussed by, amongst others, Goldstein (1986), Bryk and Raudenbush (1992), Willett *et al*. (1998), Singer and Willett (2003), Rabe-Hesketh and Skrondal (2004, 2008), and Hox (2010). From a conceptual perspective, the problem consists of analyzing the data at one level, and drawing conclusions at another level. From a statistical point of view, if data from subunits (e.g., firms) are aggregated into fewer higher level units (e.g., countries), information is lost, and the statistical analysis loses power. On the other hand, if data are disaggregated ordinary statistical tests treat all the disaggregated values as independent information from a larger sample leading to "... many spuriously 'significant' results", as discussed by Hox (2010, p. 5).

Ordinary least squares regression methods assume independence and homoscedasticity of residuals. However, in longitudinal data the residuals tend to be autocorrelated and heteroscedastic, and the violation of these assumptions results in biased standard errors. Although there are general accepted procedures to correct for autocorrelation and heteroscedasticity, the problem of condensing in a single level of analysis variables

[5] Refer to Bryan and Jenkins (2013) for a detailed review of regression modelling approaches to modelling individual and country effects from multilevel country data.

from different hierarchical stages still remains. In multilevel problems, there are not only individuals clustered within groups, but there are also variables measured at all available levels. In view of this, "Combining variables from different levels in one statistical model is a different and more complicated problem than estimating and correcting for design effects" (Hox, 2010, p. 6). As a consequence, hierarchical models are more appropriate than conventional multiple regressions to examine multilevel data because they are designed to analyze variables from different levels simultaneously, using a statistical model that includes the various dependencies.

The multilevel regression model is a hierarchical linear regression model, with a dependent variable defined at the lowest level (usual the individual), and explanatory variables at all existing levels. In longitudinal designs, which is a particular case of multilevel models, the repeated measures (occasions) within individuals are the lowest level. Then, the individual level becomes the second level, being possible to add a third or higher levels of analysis (Goldstein, 1986; Singer and Willet, 2003; Hox, 2010).

In the present study, a three-level model is applied in which the hierarchical structure of the data assumes the country as the outmost level (the third level), the firms as the second-level, and the repeated observations over time (occasions) as the first-level units. That is to say, the model considers repeated measurements nested within firms that are clustered within different countries. An important implication of this structure is that measurements within the same country are correlated, and that measurements within the same firm are correlated even further. Multilevel models (variance component models or random coefficient models) are designed to model and estimate such within-cluster correlations.

The advantages of using multilevel models to analyze repeated measures data are pointed out by, amongst others, Bryk and Raudenbush (1992), Willett *et al*. (1998), Singer and Willett (2003), and Hox (2010). As stated by Willett *et al*. (1998, p. 395), the flexibility of this statistical model provides researchers with more powerful ways of answering their research questions. For instance, by specifying varying regression coefficients at the occasion level, multilevel models allow different trajectories for each individual (individual growth modeling), by specifying a specific structure for the variances and covariances at either level of analysis, multilevel models allow the

covariances between the repeated measures to be modeled as well, and by simply adding time-varying or time-constant explanatory variables, multilevel models allow to model both the average group development, and the individual development.

In multilevel models the parameters (regression coefficients and variance components) are commonly estimated using Maximum Likelihood (ML) methods. The ML method is a general estimation procedure which produces estimates for the population parameters that maximize the probability of observing the data that are actually observed, given the model (Eliason, 1993). An advantage of the ML estimation method is that estimates have three desirable properties: they are asymptotically unbiased (consistent); asymptotically normally distributed; and asymptotically efficient. In large samples these properties are likely to hold, in small samples they hold only approximately[6].

Two different likelihood functions are currently used: the Full ML (FML), and the Restricted ML (RML). In practice the differences between the two methods are generally minor (Snijders and Bosker, 1999; Hox, 1998, 2010), being that RML should, in theory, lead to better estimates, especially when the number of groups is small (Brye and Raudenbush, 1992; Longford, 1993). However, one disadvantage of RML, when compared to FML, is that the likelihood ratio test cannot be used to compare two models with different fixed effects specifications, only the differences in the random part (the variance components) can be evaluate. Aiming at to control if differences between the estimates are actually trivial (as suggested by previous literature), models were estimated using both RML and FML functions, being the latter used to perform overall likelihood ratio (LR) tests.

From the likelihood function, a statistic called the *deviance* can be computed as minus two times the value of the log likelihood (where the likelihood is the value of the ML function at convergence). In general, models with a lower *deviance* fit better than models with a higher *deviance*. If a smaller model is a subset of (nested in) a larger model, the difference between the two *deviances* can be tested against a chi-square distribution with degrees of freedom equal to the difference in the number of parameters

[6] How large a sample must be to assure these properties is a question that does not have a straightforward answer. Long (1997) recommends a minimum of 100 individuals, while Snijders and Bosker (1999) admit a minimum of 30. Refer to Hox (2010, pp. 233-237) for a discussion of sample sizes and accuracy of estimates in multilevel models.

estimated in each model. This procedure was used to test whether a more general model fits significantly better than a simpler model. It was also applied to test the significance of random effects by comparing the *deviance* of a model containing the additional variances and covariances to the *deviance* of the same model without these particular random terms. As regard to the significance of fixed effects (regression coefficients), it was evaluated with individual Wald tests (i.e., the parameter estimate was divided by its standard error, and the result was referred to the standard normal distribution).

The strategy for building the model consisted in a bottom-up approach, as illustrated in Table 5-3. It is the most common procedure in multilevel modelling (Hox, 2008, pp. 55-56), and starts by analyzing the simplest possible model (the null model or intercept-only model). Then, explanatory variables are added, on a step-by-step basis, to test the hypothesis H1 to H7b formulated earlier. In the first step, the intercept only model gives an estimate of the intraclass correlation (the proportion of the variance explained by the grouping structure in the population), and a value of the *deviance* (the degree of misfit of the model). In the following steps, those benchmarks are used to assess the contribution of each parameter that is added, and to test the improvement in the adjustment of the model (i.e., the decrease of model misfit). Then, the decision of which regression coefficients or co(variances) are to keep in the model is based on the significance tests, the change in the *deviance*, and the changes in the variance components.

Following previous literature (Hox, 2010, p. 55), final models (Model 5-5.1 to Model 5.6.2) are as parsimonious as possible, including only those parameters that are of special interest for the present investigation or have proven their worth in previous research. The estimation was made using version 12.0 of the software STATA.

Table 5-3: Model specification following a bottom-up approach

Step 1

Model 5-0: Null model with 2 hierarchical levels

$DISC_{ti} = \beta_{00} + \varepsilon_{ti} + \mu_{0i}$

Model 5-1: Null model with 3 hierarchical levels

$DISC_{tij} = \gamma_{000} + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Step 2

Model 5-2.1: Model 5-1 plus Time (linear trend)

$DISC_{tij} = \gamma_{000} + \gamma_{100}\, Year_{tij} + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Model 5-2.2: Model 5-1 plus Time (quadratic trend)

$DISC_{tij} = \gamma_{000} + \gamma_{100}\, Year_{tij} + \gamma_{200}\, Year\_sqr_{tij} + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Step 3

Model 5-3: Model 5-2.2 plus time-varying covariates and level-2 predictors

$DISC_{tij} = \gamma_{000} + \gamma_{100}\, Year_{tij} + \gamma_{200}\, Year\_sqr_{tij} + \gamma_{300}\, FS\&M_{tij} + \gamma_{400}\, FList_{tij} +$
$+ \gamma_{010}\, Ind_{ij} +$
$+ \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Step 4

Model 5-4: Model 5-3 plus level-3 predictors

$DISC_{tij} = \gamma_{000} + \gamma_{100}\, Year_{tij} + \gamma_{200}\, Year\_sqr_{tij} + \gamma_{300}\, FS\&M_{tij} + \gamma_{400}\, FList_{tij} +$
$+ \gamma_{010}\, Ind_{ij} +$
$+ \gamma_{001}\, Mand\_Guid_{j} + \gamma_{002}\, NMD\_Guid_{j} + \gamma_{003}\, NMND\_Guid_{j} +$
$+ \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Step 5

Model 5-5.1: Model 5-4 plus cross-level interactions and random slopes at level-2 (FS&M)

$DISC_{tij} = \gamma_{000} + \gamma_{100}\, Year_{tij} + \gamma_{200}\, Year\_sqr_{tij} + \gamma_{300}\, FS\&M_{tij} + \gamma_{400}\, FList_{tij} +$
$+ \gamma_{010}\, Ind_{ij} +$
$+ \gamma_{001}\, Mand\_Guid_{j} + \gamma_{002}\, NMD\_Guid_{j} + \gamma_{003}\, NMND\_Guid_{j} +$
$+ \gamma_{101}\, Year_{tij} \times Mand\_Guid_{j} + \gamma_{301}\, FS\&M_{tij} \times Mand\_Guid_{j} +$
$+ \gamma_{102}\, Year_{tij} \times NMD\_Guid_{j} + \gamma_{302}\, FS\&M_{tij} \times NMD\_Guid_{j} +$
$+ \gamma_{103}\, Year_{tij} \times NMND\_Guid_{j} + \gamma_{303}\, FS\&M_{tij} \times NMND\_Guid_{j} +$
$+ \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j} + \mu_{3ij}\, FS\&M_{tij}$

Model 5-5.2: Model 5-5.1 with $DIFRS_{tij}$ (IFRS disclosure index) as the dependent variable

Model 5-5.3: Model 5-5.1 with $DQuant_{tij}$ (Quantitative disclosure index) as the dependent variable

Model 5-5.4: Model 5-5.1 with $DQualit_{tij}$ (Qualitative disclosure index) as the dependent variable

Step 6

Model 5-6.1: Model 5-5.1 plus control variables (Size | OwC | CME | MME)

$DISC_{tij} = \gamma_{000} + \gamma_{100} Year_{tij} + \gamma_{200} Year\_sqr_{tij} + \gamma_{300} FS\&M_{tij} + \gamma_{400} FList_{tij} + \gamma_{500} Size_{tij} + \gamma_{600} OwC_{tij} +$
$+ \gamma_{010}\, Ind_{ij} +$
$+ \gamma_{001}\, Mand\_Guid_{j} + \gamma_{002}\, NMD\_Guid_{j} + \gamma_{003}\, NMND\_Guid_{j} + \gamma_{004}\, CME_{j} + \gamma_{005}\, MME_{j}$
$+ \gamma_{101}\, Year_{tij} \times Mand\_Guid_{j} + \gamma_{301}\, FS\&M_{tij} \times Mand\_Guid_{j} +$
$+ \gamma_{102}\, Year_{tij} \times NMD\_Guid_{j} + \gamma_{302}\, FS\&M_{tij} \times NMD\_Guid_{j} +$
$+ \gamma_{103}\, Year_{tij} \times NMND\_Guid_{j} + \gamma_{303}\, FS\&M_{tij} \times NMND\_Guid_{j} +$
$+ \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j} + \mu_{3ij}\, FS\&M_{tij}$

Model 5-6.2: Model 5-6.1 with $DIFRS_{tij}$ (IFRS disclosure index) as the dependent variable

where:

Subscripts t i j represent measurement occasion, firm, and country, respectively.

DISC represents the firm's disclosure index, covering the items related to GHG emission allowances within IFRS and Resolution ICAC (2006).

DIFRS represents the firm's disclosure index covering the items related to GHG emission allowances only within IFRS.

DQuant represents the firm's disclosure index covering only quantitative (*hard*) information related to GHG emission allowances within IFRS and Resolution ICAC (2006).

DQualit represents the firm's disclosure index covering only qualitative (*soft*) information related to GHG emission allowances within IFRS and Resolution ICAC (2006).

Year represents the time variable that indicates the measurement occasion.

FS&M is a level-1 time-varying covariate representing the degree of internationalization of the firm according to the intensity of foreign sales and the variety of foreign markets.

FList is a level-1 time-varying covariate representing internationalization through capital markets, according to the firm's listing status.

Ind is a level-2 time-invariant predictor representing the firm's industry affiliation.

Mand_Guid, *NMD_Guid*, *NMND_Guid* are level-3 explanatory variables representing type of guidance, on GHG emission allowances in the annual accounts, in each country: *Mand_Guid* - Mandatory Guidance; *NMD_Guid* - Not Mandatory Detailed Guidance; *NMND_Guid* - Not Mandatory Not Detailed Guidance (being *No_Guid* - No Guidance the omitted category).

Size, *OwC* are control variables (level-1 time-varying covariates) representing the firm's size and ownership concentration, respectively.

MME, CME are level-3 control variables representing the type of business system in each country: *MME* - Mixed Market Economies; *CME* - Coordinated Market Economies (being *LME* - Liberal Market Economies the omitted category).

ε_{ti}, $\mu_{0i,}$ ε_{tij}, μ_{0ij}, μ_{3ij} $FS\&M_{tij}$, υ_{00j} represent random error terms.

The dependent variable (disclosure index)

For the purpose of measuring firms' level of disclosure, a disclosure index (dichotomous, unweighted, and adjusted for non-applicable items) has been constructed. First, the content analysis technique was applied to firms' annual reports, which were comprehensively analyzed, as described further. In accordance with the Resolution ICAC (2006), the analysis covers all the relevant items listed in the general provisions of previous standards (IAS 38, IAS 37, IAS 20), and additional information required by Article 9th of ICAC (2006). The list totals 34 items grouped as follows:

General provisions within IFRS		13
of which		
IAS 38	6	
IAS 37	5	
IAS 20	2	
Resolution ICAC (2006) additional note		21
Total disclosure items		34

The detailed components of the index are presented in Annex II.

Following related literature, each issue in the checklist is treated as a dummy variable (dichotomously). A score of one is assigned to an item if it is disclosed and a score of zero otherwise. In assigning the score for each item, its applicability to each firm was taken into account.

Concerning accounting policy choice, the related income statement and balance sheet notes were checked to assure that declarations in the accounting policy note were being interpreted correctly. If a firm's accounting policy was not stated and could not be determined from other disclosure note, the firm was included in the "not disclosed" category. It should be noted that all firms in the sample operate installations under EU-ETS. Therefore, the sample comprises no "non-applicable" cases on the topic of accounting policy. As regards the information to be provided in other explanatory notes to the annual accounts, whenever data concerning contingent liabilities, and costs with fines or penalties related to GHG emissions was missing, the distinction between "non-

applicable" and "non-disclosure" cases was based upon the statements made in the correspondent sustainability or environmental reports about those same issues[7].

Then, for each firm, a total score is calculated as equaling the unweighted sum of the relevant (applicable) items for that firm. Here, the implied assumption is that each item is equally important for all user groups. Although some disclosures might be of more importance than others (Cooke, 1989; Adams *et al*., 1998), to assign different weight to various items would introduce more subjectivity and might lead to a greater bias than the one resulting from the unweighted scoring approach (Gray *et al*., 1995b) selected for this study. Finally, a percentage is computed, for each area as well as for the checklist as a whole, according to the following expression:

$$DISCi = \sum_{j=1}^{m} dj/m$$

where:
DISC*i* represents the level of disclosure (disclosure index) for firm *i*
m is the maximum number of relevant (applicable) items that firm *i* may disclose
d*j* is a dummy variable equaling 1 if item *j* is disclosed, and 0 otherwise.

Tables 5-4 and 5-5 summarize descriptive statistics for the dependent variable. Items directly related to disclosure on GHG emission allowances within IFRS, and those introduced by ICAC (2006) were analyzed either separately (*DIFRS*, *DICAC*) or as a whole (*DISC*). Additionally, following Cormier *et al*. (2009), the whole set of headings was rearranged into two different subgroups, according to the nature of the information they convey. The items covering quantitative (*hard*) information were combined into a single disclosure index (DQuant) to measure the level of more *objective*, *informative*, and *credible* disclosure. The remaining items were pooled into another index (DQualit) to capture the level of merely declarative (*soft*) disclosure. The detailed components of each index are presented in Annex II.

[7] Namely, Indicators EC2 (Financial implications and other risks and opportunities for the organization's activities due to climate change), and EN28 (Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations) required by GRI's G3.1 Sustainability Reporting Guidelines.

Table 5-4: Descriptive statistics for the dependent variables, over 2005-2012

PANEL A			PANEL B				
	Firm-year observations	%	Variable	Mean	Std. Dev.	Min	Max
Scenario A							
No Guidance	592	44,0	Overall disclosure index (DISC)	0,12	0,19	0,00	0,74
			IFRS disclosure index (DIFRS)	0,13	0,22	0,00	0,85
			ICAC disclosure index (DICAC)	0,11	0,20	0,00	0,86
			Disclosure on quantitative items (DQuant)	0,05	0,12	0,00	0,62
			Disclosure on qualitative items (DQualit)	0,22	0,33	0,00	1,00
Scenario B							
Not Mandatory Guidance	576	42,9	Overall disclosure index (DISC)	0,33	0,27	0,00	0,85
			IFRS disclosure index (DIFRS)	0,37	0,29	0,00	1,00
			ICAC disclosure index (DICAC)	0,30	0,28	0,00	0,90
			Disclosure on quantitative items (DQuant)	0,18	0,22	0,00	0,81
			Disclosure on qualitative items (DQualit)	0,56	0,40	0,00	1,00
of which:							
B1 Not Mandatory Not Detailed	*448*		Overall disclosure index (DISC)	0,27	0,25	0,00	0,85
			IFRS disclosure index (DIFRS)	0,32	0,27	0,00	0,92
			ICAC disclosure index (DICAC)	0,24	0,26	0,00	0,86
			Disclosure on quantitative items (DQuant)	0,14	0,19	0,00	0,71
			Disclosure on qualitative items (DQualit)	0,49	0,39	0,00	1,00
B2 Not Mandatory Detailed	*128*		Overall disclosure index (DISC)	0,52	0,24	0,00	0,85
			IFRS disclosure index (DIFRS)	0,54	0,30	0,00	1,00
			ICAC disclosure index (DICAC)	0,51	0,25	0,00	0,90
			Disclosure on quantitative items (DQuant)	0,34	0,25	0,00	0,81
			Disclosure on qualitative items (DQualit)	0,81	0,31	0,00	1,00
Scenario C							
Mandatory Guidance	176	13,1	Overall disclosure index (DISC)	0,75	0,19	0,00	1,00
			IFRS disclosure index (DIFRS)	0,79	0,23	0,00	1,00
			ICAC disclosure index (DICAC)	0,73	0,18	0,00	1,00
			Disclosure on quantitative items (DQuant)	0,65	0,27	0,00	1,00
			Disclosure on qualitative items (DQualit)	0,91	0,12	0,00	1,00
Full sample							
	1 344	100,0	Overall disclosure index (DISC)	0,29	0,31	0,00	1,00
			IFRS disclosure index (DIFRS)	0,32	0,33	0,00	1,00
			ICAC disclosure index (DICAC)	0,27	0,31	0,00	1,00
			Disclosure on quantitative items (DQuant)	0,19	0,27	0,00	1,00
			Disclosure on qualitative items (DQualit)	0,45	0,42	0,00	1,00

DISC: Overall disclosure index, covering the items related to GHG emission allowances within IFRS and Resolution ICAC (2006).
DIFRS: IFRS disclosure index, covering the items related to GHG emission allowances only within IFRS.
DICAC: ICAC disclosure index, covering only the items added by Resolution ICAC (2006).
DQuant: Quantitative disclosure index, covering only quantitative information related to GHG emission allowances within IFRS and ICAC (2006).
DQualit: Qualitative disclosure index, covering only qualitative information related to GHG emission allowances within IFRS and ICAC (2006).

Over the research period, the index (*DISC*) mean for the whole sample was of 0,29. Higher levels of disclosure are observed among firms under mandatory guidance, where mean reached a score of 0,75. Moreover, the level of disclosure for firms domiciled in countries where national guidance was issued, though not mandatory for firms under IFRS, reached a mean of 0,33, more than doubling the mean of 0,12 observed among firms domiciled in countries where no specific guidelines on accounting for GHG emission allowances were provided. When performing the non-parametric Wilcoxon-Mann-Whitney (WMW) test to compare subsamples, results indicate that these differences are statistically significant to a level of significance of 1%. Thus far, in line with prior research (Criado-Jiménez *et al*., 2008; da Silva Monteiro and Aibar-Guzmán, 2010) results suggest that, though not ensuring full compliance, formal guidance increases the level of environmental disclosure in the annual accounts.

Additionally, a more in-depth analysis of firms domiciled in countries where not mandatory guidance was delivered (Table 5-4 | scenario B) shows that, where national guidance on accounting for GHG emission allowances includes specific requests on disclosure items (Table 5-4 | scenario B2), the disclosure index has a mean of 0,52, while where no specific requests on disclosure items were set out (Table 5-4 | scenario B1), the observed average equals only 0,27. When performing the WMW test to compare subsamples, results indicate that differences are statistically significant to a level of significance of 1%. Hence, exploratory analysis seems in line with previous research (Criado-Jiménez *et al*., 2008; Peters and Romi, 2013) suggesting that higher levels of disclosure are more likely to occur when guidance is clearly delineated.

Also, the annual evolution of the disclosure index under mandatory guidance seems consistent with Deegan's (2002) assertion that, at least, a minimum of information is ensured by regulations. The Resolution ICAC (2006) was issued in 8 February 2006, entering into force on the day following that of publication in the Official State Bulletin. As the standard was delivered in early 2006, some firms may have it applied to 2005 accounts. So, already in this first year the level of disclosure by Spanish firms was significantly higher than in any other subsample (Table 5-5). Full effects of the standard came in 2006, leading to an increase of the disclosure index, being that, from there on, no cases of non-disclosure were registered among firms under mandatory guidance.

Table 5-5: Descriptive statistics for the overall disclosure index (DISC), by year

Type of guidance	Firm-year observations	%	Year	Mean	Std. Dev.	Min	Max
Scenario A							
No Guidance	592	44,0	2005	0,10	0,19	0,00	0,74
			2006	0,11	0,18	0,00	0,74
			2007	0,12	0,19	0,00	0,74
			2008	0,12	0,19	0,00	0,74
			2009	0,12	0,19	0,00	0,74
			2010	0,12	0,19	0,00	0,74
			2011	0,12	0,19	0,00	0,74
			2012	0,12	0,19	0,00	0,74
Scenario B							
Not Mandatory Guidance	576	42,9	2005	0,28	0,26	0,00	0,74
			2006	0,33	0,28	0,00	0,85
			2007	0,33	0,28	0,00	0,85
			2008	0,33	0,27	0,00	0,85
			2009	0,35	0,27	0,00	0,85
			2010	0,34	0,27	0,00	0,85
			2011	0,34	0,27	0,00	0,85
			2012	0,34	0,27	0,00	0,85
of which:							
B1 Not Mandatory Not Detailed	*448*		2005	0,25	0,24	0,00	0,71
			2006	0,28	0,25	0,00	0,79
			2007	0,28	0,25	0,00	0,79
			2008	0,27	0,25	0,00	0,82
			2009	0,27	0,25	0,00	0,82
			2010	0,28	0,25	0,00	0,82
			2011	0,29	0,26	0,00	0,85
			2012	0,29	0,26	0,00	0,85
B2 Not Mandatory Detailed	*128*		2005	0,40	0,29	0,00	0,74
			2006	0,53	0,27	0,00	0,85
			2007	0,52	0,28	0,00	0,85
			2008	0,54	0,23	0,00	0,85
			2009	0,55	0,22	0,00	0,85
			2010	0,55	0,22	0,00	0,85
			2011	0,55	0,22	0,00	0,85
			2012	0,55	0,22	0,00	0,85
Scenario C							
Mandatory Guidance	176	13,1	2005	0,66	0,26	0,00	1,00
			2006	0,76	0,16	0,44	1,00
			2007	0,75	0,17	0,38	1,00
			2008	0,76	0,16	0,38	1,00
			2009	0,77	0,18	0,32	1,00
			2010	0,77	0,18	0,32	1,00
			2011	0,77	0,18	0,32	1,00
			2012	0,77	0,18	0,32	1,00
Full sample	1 344	100,0	2005	0,25	0,29	0,00	1,00
			2006	0,29	0,31	0,00	1,00
			2007	0,29	0,31	0,00	1,00
			2008	0,30	0,30	0,00	1,00
			2009	0,30	0,31	0,00	1,00
			2010	0,30	0,31	0,00	1,00
			2011	0,30	0,31	0,00	1,00
			2012	0,30	0,31	0,00	1,00

Notwithstanding, the descriptive statistics for the disclosure index, on an item-by-item basis (Annex III | Annex IV), suggest that mandatory guidance doesn't give rise to a similar increase in all headings. Over 2005-2012, under mandatory guidance, the highest mean score (0,99) corresponds to the description of the "valuation methods applied", while the lowest mean value (0,23) regards to "fines and contingent liabilities".

Furthermore, when considering the release on quantitative (monetary and non-monetary) versus qualitative (declarative) information (Table 5-4 | DQuant *vs* DQualit), patterns of disclosure reveal that, on average, quantitative items show lower levels of disclosure than those headings addressing qualitative information, for all and each one of the scenarios under review. In particular, for firms under mandatory guidance, the average level of disclosure concerning quantitative data (0,65) is 26 percentage points lower than the one observed for qualitative information (0,91).

The independent variables

According to the hypotheses formulated in section 5.2, the independent variables are time, internationalization, industry affiliation, and type of guidance in home-country. Additionally, size, profitability, leverage, ownership concentration and institutional environment were considered as control variables. Tables 5-6 and 5-7 summarize the proxies for these explanatory variables and their descriptive statistics. Correlation matrices are presented in Annex V.

Table 5-6: Definitions and proxies of the independent variables

Variables	Definitions and proxies
Time	
Year	Ordinal variable, labeled from 0 to 7, representing the years 2005 to 2012, respectively.
Internationalization	
Foreign_Listing (FList)	Dummy variable capturing internationalization trough capital markets. Equals 0 for firms listed only in domestic stock exchanges, and 1 for firms listed in both domestic and foreign stock exchanges.
Foreign Sales & Markets (FS&M)	Continuous variable representing percentage of sales to foreign markets weighted by the relative number of foreign reportable geographical segments.

Industry affiliation	
Industry (Ind)	Dummy variable that equals 1 for the more carbon intensive industries (utilities | oil&gas | basic materials), and 0 otherwise (industrials | consumer goods&services | other) (Stanny and Ely, 2008; Choi *et al*., 2013)
Type of guidance	
No Guidance (No_Guid)	Dummy variable that equals 1 for countries where no specific guidance on how to report GHG emission allowances in the annual accounts was delivered, and 0 otherwise (*the omitted category*).
Not-Mandatory Guidance (Not_Mand_Guid)	Dummy variable that equals 1 for countries where national guidance on how to report GHG emission allowances in the annual accounts is not mandatory for firms under IFRS, and 0 otherwise.
Mandatory Guidance (Mand_Guid)	Dummy variable that equals 1 for countries where national guidance on how to report GHG emission allowances in the annual accounts (covering specific requests on disclosure items) is mandatory for firms under IFRS, and 0 otherwise.
Alternately Not-Mandatory Guidance is divided into two categories:	
Not-Mandatory Detailed (NMD_Guid)	Dummy variable that equals 1 for countries where national guidance on how to report GHG emission allowances in the annual accounts, not mandatory for firms under IFRS, includes specific requests on disclosure items, and 0 otherwise.
Not-Mandatory Not-Detailed (NMND_Guid)	Dummy variable that equals 1 for countries where national guidance on how to report GHG emission allowances in the annual accounts, not mandatory for firms under IFRS, does not include specific requests on disclosure items, and 0 otherwise.
Control variables	
Size	Size measured by natural logarithm of total assets at the end of fiscal year (Choi *et al*., 2013).
Return on Assets (ROA)	Profitability measured by return on assets (Choi *et al*., 2013).
Leverage (LEV)	Leverage measured by percentage of total debt to book value of equity (Choi *et al*., 2013).
Ownership Concentration (OwC)	Dummy variable that equals 0 if no investor or related investors own more than 20% of a firm's votes; and 1 otherwise (Aerts *et al*., 2008).
Institutional environment	Types of business system (Hall and Soskice, 2001; Carnevale *et al*., 2012)
Coordinated Market Economies (CME)	Dummy variable that equals 1 for Austria, Belgium, Denmark, Finland, Germany, Netherlands, Sweden, and 0 otherwise.
Mixed Market Economies (MME)	Dummy variable that equals 1 for France, Greece, Italy, Portugal, Spain, and 0 otherwise.
Liberal Market Economies (LME)	Dummy variable that equals 1 for Ireland and UK, and 0 otherwise (*the omitted category*).

Table 5-7: Descriptive statistics for the independent variables, over 2005-2012

PANEL A				
Continuous variables	**Mean**	**Std. Dev.**	**Min**	**Max**
Foreign Sales (%)	68,1	26,2	0,0	99,0
Foreign Sales&Markets (%)	46,7	26,8	0,0	99,0
Assets (M€)	24 528	44 960	59	369 992
LnAssets	8,8	1,8	4,1	12,8
Turnover (M€)	17 925	39 932	62	470 171
LnTurnover	8,5	1,7	4,1	13,1
Return on Assets (%)	4,6	6,0	(42,1)	32,6
Leverage	2,4	4,2	0,2	116,9
PANEL B				
Non-continuous variables			**N**	**%**
Foreign-Listing				
0 Only domestic stock exchanges			1 117	83,1
1 Foreign stock exchanges			227	16,9
Industry				
0 Industrials, Consumer G&S, Other			736	54,8
1 Utilities, Oil&Gas, Basic Materials			608	45,2
Ownership concentration				
0 Less than 20% of votes			620	46,1
1 20% of votes or more			724	53,9
Type of Guidance				
No Guidance			592	44,0
Not Mandatory Guidance			576	42,9
of which:				
Not Mandatory Not Detailed Guidance			*448*	*77,8*
Not Mandatory Detailed Guidance			*128*	*22,2*
Mandatory Guidance			176	13,1
Institutional environment				
Coordinated Market Economies (CME)			616	45,8
Mixed Market Economies (MME)			536	39,9
Liberal Market Economies (LME)			192	14,3
Firm-year observations			**1 344**	**100,0**

As presented in Table 5-7, the sample comprises a great variety of firms, in terms of their dimension, level of internationalization and financial condition (measured by return on assets and leverage).

With regard to size, measure by total assets, full sample ranges from a minimum of 59 to a maximum of € 369 992 million, arriving at a mean of € 24 528 million. Considering turnover, great variability is also observed. Mean is of € 17 925 million, whereas standard deviation amounts to € 39 932 million.

Concerning internationalization through foreign sales, the proportion of income from foreign sales to total sales, ranges from 0 to 99,0%, for the whole sample, leading to a mean of 68,1% (Table 5-7 | Panel A). Among subsamples (Annex VI to Annex X), the highest mean rate of international sales (72,0%) is observed for firms under scenario B (Not Mandatory Guidance), and the lowest (52,3%) is registered by firms in scenario C (Mandatory Guidance). With respect to variety of foreign markets, about 71,6% of the whole sample firms operates in three or more geographical segments outside the country of domicile. Among subsamples, this percentage ranges from 59,6%, in scenario C (Mandatory Guidance), to 75,2% in scenario B (Not Mandatory Guidance).

After weighting the percentage of foreign sales by the relative number of foreign reportable geographical segments (arriving at variable Foreign Sales & Markets), the observed mean drops to 46,7%, for the whole sample (Table 5-7 | Panel A). Among subsamples (Annex VI to Annex X), the lowest mean rate of international exposure (27,9%) is observed for firms under scenario C (Mandatory Guidance). Within not mandatory guidance (scenario B), the degree of internationalization ranges from 48,5% in scenario B2 (Not Mandatory Detailed) to 51,7% in scenario B1 (Not Mandatory Not Detailed). Finally, under no guidance (scenario A) mean is of 48,2%.

As regards financial condition, assessed by return on assets and leverage, means are respectively of 4,6% and 2,4, for the entire sample (Table 5-7 | Panel A). Among subsamples (Annex VI to Annex X), greatest variability is registered for firms under scenario A (No Guidance), where means for profitability and leverage equal 5,5% and 2,8, and standard deviations are of 6,9% and 6,0, respectively.

Considering listing status, great majority (83,1%) of firms in the whole sample is listed only in domestic stock markets (Table 5-7 | Panel B). This percentage rises to 90,9% under scenario C (Annex X), which means that from the 22 sample firms (176 firm-year observations) domiciled in Spain, only 2 (16 firm-year observations) were listed abroad.

Regarding industry affiliation, industrials' firms are the most represented in the whole sample (27,4%), followed by basic materials (23,8%), consumer goods & services (21,4%), utilities (11,9%), oil&gas (9,5%), and miscellaneous (6%) (Table 5-1). The more carbon intensive industries (utilities, oil & gas, and basic materials) represent

45,2% of the whole sample, whereas the remaining activities (industrials, consumer goods & services, and miscellaneous) total 54,8% (Table 5-7 | Panel B). The underlying notion of carbon intensity follows the guidelines by the EU-ETS (EC, 2003, 2009), and is consistent with prior research on environmental disclosure (e.g., Stanny and Ely, 2008; Choi *et al*., 2013).

When assessing ownership concentration, no investor or related investors owned more than 20% of a firm's voting rights, in about 46,1% of the whole sample firms (Table 5-7 | Panel B). Distribution among subsamples (Annex VI to Annex X) varies from 38,2%, in scenario B (Not Mandatory Guidance), to 53,9%, in scenario A (No Guidance).

With regard to institutional environment, firms with headquarters in Liberal Market Economies (Ireland, and UK) represent 14,3% of the whole sample, firms domiciled in Mixed Market Economies (France, Greece, Italy, Portugal, and Spain) have a relative weight of 39,9%, and firms in Coordinated Market Economies (Austria, Belgium, Denmark, Finland, Germany, Netherlands, and Sweden) amount to 45,8% (Table 5-7 | Panel B). As mentioned earlier, the underlying notion of institutional similarities and differences across countries is based on varieties of capitalism approach proposed by Hall and Soskice (2001), and followed by previous investigation on environmental disclosure (Carnevale *et al.,* 2012).

5.4. Results and conclusions

This section presents the results corresponding to the bottom-up strategy described in Table 5-3.

The first step consists of analysing a model with no explanatory variables. This *intercept-only model* gives an estimate of the intraclass correlation (the proportion of the variance explained by the grouping structure in the population), and a value of the *deviance* (the degree of misfit of the model). In the following steps, those benchmarks are used to assess the contribution of each parameter that is added, and to test the improvement in the adjustment of the model. A comprehensive analysis of estimation results is presented in the last step. In the intermediate stages, only those parameters that justify the choice of model to follow are analyzed.

Step 1 - The intercept-only model

Estimation results presented in Table 5-8 corresponds to a null model with only two hierarchical levels: repeated measurements (level-1) nested within firms (level-2).

Table 5-8: Estimation results for Model 5-0 - the *null model* with 2 hierarchical levels

Number of observations 1 344	Dependent variable - Overall disclosure index (DISC)		
Number of groups:	Model 5-0		
2nd level (firms) 168	Null model		
Number of occasions: 8 (1st level)	(*Intercept-only model*)		
FIXED PART	Coef.	Std. Error	
Intercept	0,2911 ***	(0,0230)	
RANDOM PART	Estimate	Std. Error	**Variance components:**
Firm level			
Variance (_cons)	0,0878	(0,0097)	← Between firms
Variance (Residual)	0,0054	(0,0002)	← Within firms
Log likelihood	1 193,6		
Deviance	-2 387,2		

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets

Model 5-0:

$DISC_{ti} = \beta_{00} + \varepsilon_{ti} + \mu_{0i}$

Considering the fixed part of Model 5-0, the intercept of 0,2911 is simply the estimate of the average disclosure index across all firms and occasions. As regards the random part, Model 5-0 estimates the repeated measurements (level-1) variance (residual) as 0,0054, and the firm-level (level-2) variance (_cons) as 0,0878. This estimates the total disclosure index variance as 0,0932 (0,0054 + 0,0878), and indicates that the intraclass correlation at firm-level is estimated as 0,9421 (0,0878 / 0,0932).

Bearing in mind that the intraclass correlation designates the proportion of the variance explained by the grouping structure in the population, Model 5-0 shows that about 94% of the variance of the disclosure index is variance between firms, and only about 6% is variance within firms (across occasions).

However, this first model does not take into account country of domicile dependencies, since it assumes that all firms are independent. The addition of a random intercept for countries leads to Model 5-1 (Table 5-9) where a correlation between firms from the same country is allowed. Also, by introducing a third level for countries, three variance components are now estimated: residuals at level-1; random intercept at level-2; and

random-intercept at level-3. As a consequence, Model 5-1 disaggregates variance between firms into two parameters: variance between countries and variance within countries.

Table 5-9: Estimation results for Model 5-1 - the *null model* with 3 hierarchical levels

Number of observations 1 344	Dependent variable - Overall disclosure index (DISC)		
Number of groups:	Model 5-1		
3rd level (countries) 14	Null model		
2nd level (firms) 168	(*Intercept-only model*)		
Number of occasions: 8 (1st level)			
FIXED PART	Coef.	Std. Error	
Intercept	0,2767 ***	(0,0567)	
RANDOM PART	Estimate	Std. Error	**Variance components**:
Country level			
Variance (_cons)	0,0410	(0,0167)	← Between countries
Firm level			
Variance (_cons)	0,0370	(0,0043)	← Within countries
Variance (Residual)	0,0054	(0,0002)	← Within firms
Log likelihood	1 247,6		
Deviance	-2 495,3		

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets

Model 5-1:

$DISC_{tij} = \gamma_{000} + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Model 5-1 estimates the repeated measures variance as 0,0054 (level-1), the firm-level variance as 0,0370 (level-2), and the country-level variance as 0,0410 (level-3). This estimates the total disclosure index variance as 0,0834 (0,0054 + 0,0370 + 0,0410). Accordingly, the estimates of intraclass correlation are as follows:

- Between countries is estimated as 0,4916 (0,0410/0,0834)
- Within countries is estimated as 0,4437 (0,0370/0,0834)
- Within firms (across occasions) is estimated as 0,0647 (0,0054/0,0834)

Thus, the addition of a random intercept for countries revealed that about 53% (0,4916 / (0,4916 + 0,4437)) of the variance between firms was due to the country of domicile. Considering this relative weight of the variance between countries, a three level model seems more appropriate than the first one comprehending only two levels, and the Likelihood Ratio (LR) test confirms a significant ($p<0,001$) improvement in model fit, when comparing Model-1 with Model 5-0. As a consequence, a three level hierarchy is kept from here onwards.

Step 2 - The time variable is added to the model

In the second step, the time variable (Year) was added, as a linear trend, with the same coefficient for all firms (Table 5-10 | Model 5-2.1).

Table 5-10: Estimation results for Model 5-2.1 and Model 5-2.2

Number of observations 1 344		Dependent variable - Overall disclosure index (DISC)			
Number of groups:		Model 5-2.1		Model 5-2.2	
3rd level (countries) 14		Model 5-1 plus		Model 5-1 plus	
2nd level (firms) 168		Time (linear trend)		Time (quadratic trend)	
Number of occasions: 8 (1st level)					
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0054 ***	(0,0009)	0,0169 ***	(0,0031)
	Year_sqr			- 0,0016 ***	(0,0004)
	Intercept	0,2577 ***	(0,0568)	0,2462 ***	(0,0568)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0410	(0,0167)	0,0410	(0,0167)
Firm level					
	Variance (_cons)	0,0370	(0,0043)	0,0370	(0,0043)
	Variance (Residual)	0,0052	(0,0002)	0,0051	(0,0002)
Log likelihood		1 267,2		1 274,6	
Deviance		-2 534,4		-2 549,1	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets

Model 5-2.1:

$DISC_{tij} = \gamma_{000} + \gamma_{100} Year_{tij} + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Model 5-2.2:

$DISC_{tij} = \gamma_{000} + \gamma_{100} Year_{tij} + \gamma_{200} Year\_sqr_{tij} + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$

Entering the variable Year has lead to a significant improvement in model fit ($p<0,001$), and decreased the occasion level variance from 0,0054 to 0,0052 which means that time explains about 4% ((0,0054 - 0,0052) / 0,0054) of the disclosure index variance within firms (across occasions). Regression estimates indicate that, on average, the disclosure index is of 0,2577 at the first occasion (2005), and increases by 0,0054 on each succeeding year. However, a systematic linear growth in the disclosure index does not seem a realistic assumption. It should be noted that, in longitudinal designs, it is important to model the time variable appropriately, because "the specification of 'the effects of time' describes the shape of the underlying development trajectory" (Willett *et al.*, 1998, pp. 414-420). So, alternately, a quadratic (curvilinear) trend was also considered (Table 5-10 | Model 5-2.2).

As anticipated, the LR test indicate that, by adding variable Year_sqr, Model 5-2.2

offers a significantly better fit than the previous one (χ^2 = 14,73, *df* = 1, p<0,001), and estimation results suggest that, on average, the disclosure index is of 0,2462 at the first year (2005), growing at decreasing rates, from there on, following the expression 0,0169 Year – 0,0016 Year_sqr, where Year equals 0,1,2,3,4,5,6,7 from 2005 to 2012, respectively.

Step 3 - Time-covariates and level-2 explanatory variables are added to the model

In the third step, time-varying covariates (Foreign Sales & Markets, Foreign Listing), and level-2 time-invariant predictor (Industry) are added, arriving at Model 5-3 (Table 5-11). This procedure was done on a variable-by-variable basis. The corresponding intermediate models are reported in Annex XI.

Table 5-11: Estimation results for Model 5-3 and Model 5-4

Number of observations 1 344		Dependent variable - Overall disclosure index (DISC)			
Number of groups:		Model 5-3		Model 5-4	
3rd level (countries) 14		Model 5-2.2 plus		Model 5-3 plus	
2nd level (firms) 168		Time-varying covariates &		Level-3 explanatory variables	
Number of occasions: 8 (1st level)		Level-2 explanatory variables			
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0167 ***	(0,0031)	0,0167 ***	(0,0031)
	Year_sqr	- 0,0016 ***	(0,0004)	- 0,0016 ***	(0,0004)
	FSales&Markets (FS&M)	0,0022	(0,0366)	0,0010	(0,0362)
	FListing (FList)	- 0,1062 ***	(0,0310)	- 0,1023 ***	(0,0304)
	Industry (Ind)	0,1993 ***	(0,0283)	0,1961 ***	(0,0277)
	Mandatory_Guidance (Mand_Guid)			0,5719 ***	(0,0759)
	Not_Mand_Detailed_Guidance (NMD_Guid)			0,3394 ***	(0,0674)
	Not_Mand_Not_Detailed_Guidance (NMND_Guid)			0,1602 ***	(0,0487)
	Intercept	0,1738 ***	(0,0517)	0,0351	(0,0332)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0316	(0,0129)	0,0034	(0,0020)
Firm level					
	Variance (_cons)	0,0291	(0,0034)	0,0296	(0,0034)
	Variance (Residual)	0,0051	(0,0002)	0,0051	(0,0002)
Log likelihood		1 302,4		1 315,1	
Deviance		-2 604,7		-2 630,2	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets | countinuous predictors centered

Model 5-3:

$$DISC_{tij} = \gamma_{000} + \gamma_{100}\,Year_{tij} + \gamma_{200}\,Year\_sqr_{tij} + \gamma_{300}\,FS\&M_{tij} + \gamma_{400}\,FList_{tij} + \gamma_{010}\,Ind_{ij} + \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

Model 5-4:

$$DISC_{tij} = \gamma_{000} + \gamma_{100}\,Year_{tij} + \gamma_{200}\,Year\_sqr_{tij} + \gamma_{300}\,FS\&M_{tij} + \gamma_{400}\,FList_{tij} + \gamma_{010}\,Ind_{ij} + \\ + \gamma_{001}\,Mand\_Guid_{j} + \gamma_{002}\,NMD\_Guid_{j} + \gamma_{003}\,NMND\_Guid_{j} + \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

The LR test indicates a significant improvement in model fit (χ^2 = 55,58, *df* = 3, p<0,001), and, as expected, comparison between the variance components of Model 5-2.2 and Model 5-3, indicate that entering time-varying covariates, and level-2 time-invariant predictor has decreased the occasion level variance, and the variance at firm-level, by 1% and 22%, respectively. It is worth noting that, at firm-level, the major contribution for the proportion of variance explained is due to industry affiliation.

In this stage, control variables (Size, OwC, ROA, Lev) were added to the model, as reported in Annex XII. In line with, amongst others, Cormier *et al*. (2005), Freedman and Jaggi (2005), and Choi *et al*. (2013), estimation results suggest that financial condition adds no significant contribution in explaining level of carbon financial disclosure. In view of this, variables ROA and Lev were removed from the model. As regards size and ownership concentration, the LR test showed a small although significant improvement in model fit. Hence, for the sake of parsimony, control variables Size and OwC are kept out of the model until the last stage when they will be introduced again just to check the robustness of results.

Step 4 - Level-3 explanatory variables are added to the model

In the fourth step, variables representing the type of national guidance were added to the model. Two alternate classifications were considered, as described earlier in Table 5-6. The first one comprehends three categories (no guidance, not mandatory guidance, and mandatory guidance). The second makes a distinction between detailed and not detailed guidance on disclosure items, arriving at four groups (no guidance, not mandatory not detailed guidance, not mandatory detailed guidance, and mandatory (detailed) guidance). The last one provided a significantly better adjustment (p<0,05), and for that reason it was the taxonomy kept in Model 5-4 (Table 5-11).

By entering variables representing national type of guidance, the LR test indicates a significant improvement in model fit (χ^2 = 25,46, *df* = 3, p<0,001), and comparisons between the variance components of Model 5-3 and Model 5-4, show that, the estimate of the variance between countries has decreased by around 89% (0,0316 $\rightarrow$ 0,0034). Furthermore, the magnitude of the new estimate (0,0034) when compared to its standard error (0,0020) suggests that the remaining unexplained variance is no longer significant.

In this stage, control variables capturing the institutional environment in each country (CME, MME, LME) were also considered, as reported in Annex XIII. A further decrease in the estimate of the variance between countries has occurred (0,0034 → 0,0013). However, according to the LR test, an improvement in model fit is only to admit at a 10% level (χ^2 = 5,39, *df* = 2, p<0,10). In view of this, for the sake of parsimony, those variables are kept out of the model until the last stage when they will be introduced again to check the robustness of results.

Additionally, an alternative approach was also conducted by estimating a three-level model where, in the outmost stage, the criterion for grouping sample firms was the institutional environment in home-country (instead of the country of origin). Estimation results (Annex XIII) confirm that, regarding disclosure, the effects of national guidance are superior to those of institutional environment. That is to say, before entering variables representing the type of guidance in each country, the estimate variance between the three sorts of institutional environments (CME, MME, LME) is of 0,0200. When adding type of guidance, the estimate variance decreased to 0,0026. Furthermore, the magnitude of this new estimate is small relative to its standard error (0,0029), suggesting that, after considering national guidance, the remaining unexplained variance between the three types of institutional environments is no longer significant.

Step 5 - Cross-level interactions and random slopes are added to the model

To investigative whether national guidance serve as moderator of firm-level relationships between the level of disclosure and the exposure to foreign markets, a set of cross-level interactions between type of guidance, and explanatory variables *Year*, and *FSales&Markets* were added to the model. At the same time, random slopes were allowed, at firm-level, for the exposure to foreign markets (FSales&Markets), leading to Model 5-5.1 (Table 5-12). The underlying hypothesis is that the effects of internationalization may vary across groups, which is consistent with prior literature (Thorell and Whittington, 1994; Cormier *et al*., 2005; Jackson and Apostolakou, 2010) admitting either a positive or a negative relationship between internationalization and disclosure, depending on the relative degree of environmental awareness in the country of domicile and in those foreign markets where customers are located.

Table 5-12: Estimation results for Model 5-5.1 and Model 5-5.2

Number of observations 1 344		Dependent variable			
Number of groups:		Overall disclosure index (DISC)		IFRS disclosure index (DIFRS)	
3rd level (countries) 14		Model 5-5.1		Model 5-5.2	
2nd level (firms) 168		Model 5-4 plus		Model 5-5.1 with	
Number of occasions: 8 (1st level)		cross-level interactions &		IFRSs disclosure index (DIFRS)	
		random slopes at level-2 (FS&M)		as the dependent variable	
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0155 ***	(0,0031)	0,0179 ***	(0,0035)
	Year_sqr	- 0,0016 ***	(0,0004)	- 0,0019 ***	(0,0004)
	FSales&Markets (FS&M)	- 0,0415	(0,0543)	- 0,0765	(0,0596)
	FListing (FList)	- 0,0265	(0,0365)	- 0,0045	(0,0412)
	Industry (Ind)	0,1863 ***	(0,0308)	0,2082 ***	(0,0346)
	Mandatory_Guidance (Mand_Guid)	0,5633 ***	(0,0857)	0,5863 ***	(0,0801)
	Not_Mand_Detailed_Guidance (NMD_Guid)	0,3599 ***	(0,0746)	0,3499 ***	(0,0740)
	Not_Mand_Not_Detailed_Guidance (NMND_Guid)	0,1539 ***	(0,0531)	0,2095 ***	(0,0503)
	Year x Mand_Guid	0,0062 **	(0,0029)	0,0043	(0,0033)
	FSales&Markets x Mand_Guid	0,1941	(0,1656)	0,2305	(0,1821)
	Year x NMD_Guid	0,0069 **	(0,0030)	0,0051	(0,0034)
	FSales&Markets x NMD_Guid	0,4672 ***	(0,1796)	0,5702 ***	(0,1981)
	Year x NMND_Guid	- 0,0007	(0,0019)	- 0,0047 **	(0,0021)
	FSales&Markets x NMND_Guid	0,0728	(0,1261)	- 0,0430	(0,1379)
	Intercept	0,0327	(0,0360)	0,0317	(0,0356)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0038	(0,0024)	0,0022	(0,0020)
Firm level (unstructured)					
	Variance (FSales&Markets)	0,1567	(0,0425)	0,1734	(0,0456)
	Variance (_cons)	0,0279	(0,0039)	0,0383	(0,0053)
	Covariance (FSales&Markets, _cons)	0,0158	(0,0105)	0,0278	(0,0135)
	Variance (Residual)	0,0044	(0,0002)	0,0056	(0,0002)
Log likelihood		1 358,6		1 200,7	
Deviance		-2 717,3		-2 401,4	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets | countinuous predictors centered

Model 5-5.1:

$$DISC_{tij} = \gamma_{000} + \gamma_{100}\,Year_{tij} + \gamma_{200}\,Year\_sqr_{tij} + \gamma_{300}\,FS\&M_{tij} + \gamma_{400}\,FList_{tij} + \gamma_{010}\,Ind_{ij} +$$
$$+ \gamma_{001}\,Mand\_Guid_{j} + \gamma_{002}\,NMD\_Guid_{j} + \gamma_{003}\,NMND\_Guid_{j} +$$
$$+ \gamma_{101}\,Year_{tij} \times Mand\_Guid_{j} + \gamma_{301}\,FS\&M_{tij} \times Mand\_Guid_{j} +$$
$$+ \gamma_{102}\,Year_{tij} \times NMD\_Guid_{j} + \gamma_{302}\,FS\&M_{tij} \times NMD\_Guid_{j} +$$
$$+ \gamma_{103}\,Year_{tij} \times NMND\_Guid_{j} + \gamma_{303}\,FS\&M_{tij} \times NMND\_Guid_{j} +$$
$$+ \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j} + \mu_{3ij}\,FS\&M_{tij}$$

Model 5-5.2: Model 5-5.1 with $DIFRS_{tij}$ (IFRS disclosure index) as the dependent variable

Thus far, the estimate of the variance within countries has decreased by approximately 25% (0,0370 → 0,0279). In this stage, other possibilities for random effects, and interaction terms (namely comprising variable FListing) were also considered, but none of the alternatives offered a further significant contribution in explaining the remaining variance within countries. It should be noted that it is beyond the scope of this study to

design a model that fully explains carbon financial disclosure. The analysis is focused on shedding light on areas where prior research is scarce (disclosure under mandatory guidance) or showed mixed results (the effect of internationalization on disclosure). An attempt to reassess these questions is provided by Model 5-5.1 (Table 5-12).

Additionally, to evaluate if main inferences also apply to the disclosure index covering the items related to GHG emission allowances only within IFRS, Model 5-5.1 was run with the IFRS disclosure index (DIFRS) as the dependent variable, leading to Model 5-5.2. As reported in Table 5-12, main outcomes remained unchanged. In view of this, from here onwards, only the results for the overall disclosure index (DISC) are discussed. Also, it should be noted that all the results presented below remain valid after introducing control variables (Size, OwC, CME, MME), as reported in Annex XIV.

Hypotheses H1 to H4 examine whether formal guidance enhances the level of carbon financial disclosure.

Estimation results suggest that, under no guidance, the average disclosure index (DISC), in 2005, for low carbon intensive firms, listed only in domestic stock exchanges, and with average exposure to foreign markets is of 0,0327 (intercept), an estimate not significantly different from zero (Table 5-12 | Model 5-5.1). That is, under no guidance, firms operating mainly in domestic markets and pertaining to less carbon intensive industries are not likely to voluntarily release information on GHG emission allowances in their annual accounts. Furthermore, evidence indicates that, under no guidance, only high carbon intensive firms are likely to provide a significant (although quite modest) level of disclosure (Table 5-12 | Model 5-5.1 | 0,1863, $p<0,001$).

Stakeholder theory and legitimacy theory posit that disclosure is an instrument to manage or to handle the information needs of various stakeholders, and under no guidance firms have chances to differentiate themselves by releasing information voluntarily. However, the extent of voluntary disclosure will depend on managers' motivation to do so. In the light of proprietary costs theory, managers take into account not only the benefits of disclosure but also inherent costs (including proprietary costs), and do not disclose when costs outweigh benefits (Dye, 1985; Diamond and Verrecchia, 1991). On this view, results suggest that for firms pertaining to less carbon intensive

industries (that is, not specially fostered by scrutiny and public pressure due to their activities), the benefits to use financial information on GHG emission allowances as a legitimizing tool are not enough to cover the costs of such disclosure. Release on GHG emissions embodies information about corporate activities having a negative impact upon environment (Clarkson *et al*., 2008). As a consequence, under no guidance, firms operating in low carbon intensive industries do not have enough incentives to publish voluntarily carbon financial disclosure because that would have meant exposing the pursuit of polluting activities, when they are not perceived as severe pollutants by society, and institutional pressures to disclose are low. Otherwise, high carbon intensive firms, facing a legitimacy threat due to their activities, have more to gain by providing voluntarily disclosure, namely because in the case of high GHG emitters the absence of such information is more likely to be interpreted, by stakeholders, as bad news. So, in line with Diamond and Verrecchia's (1991) model, findings confirm that high carbon intensive firms with greater potential benefits from disclosure on GHG emissions tend to disclose more. Notwithstanding, under no guidance, even high carbon intensive firms do not exhibit high levels of disclosure (Table 5-12 | Model 5-5.1 | 0,1863, $p<0,001$). The continued absence of specific accounting guidance on this matter may be perceived by firms as meaning that financial information on GHG emission allowances is not particularly valued by society, being that, in accordance with institutional theory, when there is a low degree of social pressure, firms' anticipated legitimacy gains are lower (Oliver, 1991), and, thus, high levels of corporate disclosure are less likely to occur.

With regard to the explanatory variables representing not mandatory guidance, either detailed or not detailed, both coefficients (NMD_Guid | NMND_Guid) show a positive association with the level of disclosure ($p<0,01$), implying that, on average, the disclosure index is significantly higher, than under no guidance (Table 5-12 | Model 5.5-1). These results allow the non-rejection of hypothesis H1 stating that the level of carbon financial disclosure is predicted to be higher among firms domiciled in countries where national guidance on accounting for GHG emission allowances was issued, though not mandatory for entities under IFRS, than among firms domiciled in countries where no specific guidance on how to report emission allowances in the annual accounts was provided. As predicted, results are consistent with prior evidence from da Silva Monteiro and Aibar-Guzmán (2010), and Choi *et al*. (2013), suggesting that

formal guidance in home-country, though not mandatory for entities applying IFRS, is a driver of additional release.

When considering not mandatory guidance that includes detailed demands on disclosure items (NMD_Guid), on average, the disclosure index (for low carbon intensive firms, listed only in domestic stock exchanges, and with average exposure to foreign markets) is expected to be higher, than under no guidance, by 0,3599 ($p<0,001$), in 2005 (Table 5-12 | Model 5.5-1). In turn, when examining the scenario of not mandatory guidance that does not include detailed demands on disclosure (NMND_Guid), the estimated difference to the scenario of no guidance comes down to 0,1539 ($p<0,01$). Also, direct comparison between those two scenarios (NMD_Guid | NMND_Guid) confirms a statistically significant difference in favor of detailed guidance by 0,2060 (0,3599-0,1539), $p<0,01$). These results allow the non-rejection of hypothesis H2 stating that the level of carbon financial disclosure is predicted to be higher among firms domiciled in countries where national guidance on accounting for GHG emission allowances specifies detailed requests for disclosure, than under no detailed benchmarks.

Also, findings are in line with prior research on mandatory guidance (Criado-Jiménez *et al*., 2008; Peters and Romi, 2013) pointing out that regulations are more effective when clearly delineate disclosure items to be reported, and expand prior investigation, by suggesting that the same applies to non-mandatory guidance. In particular, Criado-Jiménez *et al*. (2008) argue that, in view of impression management strategies, concealment of information confirms the strength of regulation rather than its weakness, in the sense that, in response to more strict regulation, firms cannot simply dismiss the norm. On the contrary, they are compelled to accept it, although symbolically. Present research expands Criado-Jiménez *et al*.'s (2008) assertion, by providing evidence that firms are also constrained to respond to non-mandatory guidance. Formal guidance, even not mandatory, is likely to boost stakeholders' perception that lack of critical information may well correspond to bad news. As a consequence, the risk of bad reputation for holding information tends to be higher, than under no guidance. Accordingly, results suggest that firms are likely to react to non-mandatory guidance by releasing additional disclosure, especially when it clearly delineates the items to be provided in the annex (Table 5-12 | Model 5.5-1 | 0,3599, $p<0,001$).

As regards the scenario of mandatory guidance, the coefficient of variable *Mand_Guid* indicates that, on average, the disclosure index (for low carbon intensive firms, listed only in domestic stock exchanges, and with average exposure to foreign markets) is expected to be higher, than under no guidance, by 0,5633, in 2005, and this difference is significant at 1% level ($p<0,001$) (Table 5-12 | Model 5-5.1). Comparisons with the scenario of not mandatory guidance also confirm ($p<0,01$) that the level of disclosure is greater among firms under mandatory guidance, than among firms under no mandatory regime on how to report GHG emission allowances in the annual accounts, as formulated in hypothesis H3. In accordance with Diamond and Verrecchia's (1991) model, a firm's optimal level of disclosure is achieved when the marginal cost of disclosure is equal to its marginal benefit. As described by Seah and Tarca (2006), under mandatory guidance, costs of disclosure are likely to be greater because, to avoid possible penalties, more proprietary information is revealed which could damage a firm's wealth and reputation, and benefits of disclosure are potentially superior because compulsory information has more credibility especially when it is certified. As a consequence, under a mandatory regime, both the costs and the benefits of release potentially increase, changing the equilibrium point, and expanding the level of a firm's disclosure. Results corroborate this hypothesis, showing that mandatory guidance is significantly associated with higher levels of disclosure (when compared with any other scenario under review).

When examining the trend over the eight-year period (2005-2012), regression estimates suggest a quite modest growth trajectory by decreasing rates (following the expression 0,0155 Year – 0,0016 Year_sqr, for firms under no guidance, where Year equals 0,1,2,3,4,5,6,7, from 2005 to 2012, respectively). However, once again, firms under detailed guidance (mandatory or not mandatory) are likely to perform better than other sample firms, as indicated by the coefficients of the interaction terms *Year* x *Mand_Guid* (0,0062, $p<0,05$), and *Year* x *NMD_Guid* (0,0069, $p<0,05$) (Table 5-12 | Model 5.5-1). Overall, for these two scenarios, findings indicate upper starting values for the disclosure index, in 2005, and small but significantly higher growth all over the period. Concerning guidance that is not mandatory and not detailed (NMND_Guid), the estimate for the disclosure index at the starting point (2005) is significantly higher than the one associated with no guidance (0,1539, $p<0,01$), but the trajectory over the eight-

year period is not statistically different, as indicated by the non-significant coefficient of the interaction term *Year* x *NMND_Guid* (Table 5-12 | Model 5.5-1). In summary, those two scenarios (Mand_Guid, NMD_Guid) that are associated with higher levels of disclosure in 2005, also feature more favorable developments over the eight-year period.

Altogether, findings allow the non-rejection of hypotheses H1, H2, and H3 suggesting that accounting standards, even those not mandatory for entities under IFRS, have a significant positive impact on the level of disclosure on GHG emission allowances in the annual accounts, being that major improvements on the disclosure index are likely to occur under mandatory guidance followed by the case of not mandatory guidance comprehending detailed demands for disclosure items. These results are consistent with previous investigation indicating a noteworthy impact of standards on the level of disclosed environmental information (e.g., Deegan and Rankin, 1996, 1997; Owen *et al*., 1997; Larrinaga *et al*., 2002; Llena *et al.*, 2007; Criado-Jiménez *et al*., 2008; Barbu *et al*., 2014), and are in line with stakeholder theory and institutional theory.

From stakeholder theory standpoint, disclosure is a strategic response to manage or to handle stakeholders' demand for information, in order to obtain their approval. In the extent that formal guidance, even not mandatory, is likely to rise stakeholder awareness of the risks, and the associated mitigation efforts, that GHG emissions pose to firms, it contributes to increase their quest of information, and, in order to respond to greater stakeholders' pressure, management is encouraged to disclose more than under no guidance, especially when formal guidance comprises detailed dispositions on items to be reported in the annex. In particular, by enhancing stakeholders' perception of relevant information concerning GHG emission allowances, mandatory guidance is more likely to compel firms to expand the level of disclosure, not only to respond to the information needs of more aware stakeholders but also to avoid the costs of bad reputation that would be derived from simply ignore the norm.

Likewise, the importance of formal guidance (mandatory or non-mandatory) as a driver of additional disclosure is in line with institutional theory. Under enforced guidance, organizations are made more aware of public interests and are less likely to respond defiantly because the consequences of noncompliance are "more tangible and often

more severe" (Oliver, 1991, p. 168), than under no guidance. Notwithstanding, from institutional theory standpoint, institutional pressures may occur not only by means of legal regulation and enforcement but also by voluntary diffusion.

On one hand, as anticipated by Oliver (1991), when rules or norms are broadly diffused and supported, organizations are more likely to acquiesce to institutional pressures because their social validity is largely unquestioned. On this view, findings suggest that EU-15 firms domiciled in countries that ratified the Kyoto Protocol and issued formal guidance on how to report GHG emission allowances in the annual accounts appear to perceive that disclosure of financial information concerning GHG emission allowances would be important for their public image, as the efforts in meeting Protocol's targets and the release of information on costs of carbon are valued by society. In these circumstances, institutional theory predicts a low degree of organizational resistance towards mandatory guidance, and results confirm that, even not ensuring full acquiescence, mandatory guidance on accounting for GHG emission allowances is significantly associated with less withholding of information, than any other scenario under review.

On the other hand, in the case of guidance not mandatory for firms applying IFRS, a process of voluntary diffusion seems to be in place, at country level, with firms under IFRS following their home-country guidance intended only for entities under national GAAP. That is, in line with Oliver's (1991) prediction, evidence corroborates that when firms anticipate that conformity with social expectations, even though set out by non-mandatory guidance, will enhance social fitness, a process of voluntary diffusion, through imitation, is more likely to occur, than under no guidance.

These outcomes have important implications for regulatory bodies aimed at enhance the comparability of financial information within EU. Extending the hypothesis formulated by, amongst other, Nobes (2006, 2008), Kvaal and Nobes (2010), and Barbu *et al*. (2014), pointing out that, despite the adoption of IFRS since 2005, international differences are likely to survive due to pre-IFRS dissimilarities, this study suggests that even national guidance issued after 2005, and not intended for firms under IFRS since then, strongly impact their disclosure practices. As mentioned earlier (step 4), regression estimates indicate that about 53% of the variance between firms is due to the

country of domicile. However, when entering variables representing the type of national guidance, the estimate of the variance between countries decreases by more than 89%, and the estimate of the remaining unexplained variance is no longer significant.

In addition, estimation results (reported in Annex XIII) indicate that the effects of national guidance (over the level of carbon financial disclosure) are superior to those of institutional environment (CME, MME, LME). As described earlier (step 4), after entering variables representing the type of guidance in each country, the remaining unexplained variance between those three types of institutional environment is no longer significant. Largely, results indicate that national guidance, though not mandatory, exerts a major influence on disclosure practices of EU-15 firms applying IFRS. Consequently, discrepancies among national legal requirements are able to penalize the comparability of firms' accounts and inhibit the process of *de facto* (material) accounting harmonization within EU, in spite of the compulsory use of the same set of standards (IFRS) for the consolidated statements of listed firms since 2005.

Then, to evaluate if mandatory guidance has a "disciplinarian effect" on the dissemination of qualitative (*soft*) disclosure as well as quantitative (*hard*) disclosure on GHG emission allowances in the annual accounts (as formulated in hypothesis H4), Model 5-5.1 was run separately for the disclosure index on quantitative (monetary and non-monetary) items (DQuant) and qualitative (declarative) items (DQualit), leading to Model 5-5.3 and Model 5-5.4, respectively (Table 5-13).

When considering quantitative disclosure (DQuant), estimation results indicate that, under no guidance, the average disclosure index for low carbon intensive firms, listed only in domestic stock exchanges, and with average exposure to foreign markets is not significantly different from zero (Table 5-13 | Model 5.5-3). With regard to qualitative disclosure (DQualit) the estimate shows a significant but small increase to 0,0957 ($p<0,10$) (Table 5-13 | Model 5.5-4). As expected, firms under no guidance, are not likely to reveal sensitive items on GHG emission allowances (quantitative-verifiable data supposedly containing more proprietary information) and even the level of disclosure on more general statements (qualitative disclosure) is quite low.

Table 5-13: Estimation results for Model 5-5.3 and Model 5-5.4

Number of observations 1 344		Dependent variable			
Number of groups:		Quantitative disclosure (DQuant)		Qualitative disclosure (DQualit)	
3rd level (countries) 14		Model 5-5.3		Model 5-5.4	
2nd level (firms) 168		Model 5-5.1 with		Model 5-5.1 with	
Number of occasions: 8 (1st level)		Quantitative disclosure index		Qualitative disclosure index	
		(DQuant) as the dependent variable		(DQualit) as the dependent variable	
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0120 ***	(0,0033)	0,0208 ***	(0,0044)
	Year_sqr	- 0,0015 ***	(0,0004)	- 0,0019 ***	(0,0006)
	FSales&Markets (FS&M)	- 0,0061	(0,0504)	- 0,0520	(0,0709)
	FListing (FList)	- 0,0414	(0,0332)	- 0,0381	(0,0516)
	Industry (Ind)	0,1363 ***	(0,0276)	0,2655 ***	(0,0457)
	Mandatory_Guidance (Mand_Guid)	0,5511 ***	(0,0695)	0,6383 ***	(0,1230)
	Not_Mand_Detailed_Guidance (NMD_Guid)	0,2509 ***	(0,0616)	0,4996 ***	(0,1076)
	Not_Mand_Not_Detailed_Guidance (NMND_Guid)	0,0764 *	(0,0430)	0,2841 ***	(0,0767)
	Year x Mand_Guid	0,0120 ***	(0,0031)	- 0,0049	(0,0042)
	FSales&Markets x Mand_Guid	0,3076 **	(0,1565)	0,3086	(0,2095)
	Year x NMD_Guid	0,0081 **	(0,0032)	0,0059	(0,0043)
	FSales&Markets x NMD_Guid	0,2262	(0,1641)	0,7652 ***	(0,2321)
	Year x NMND_Guid	0,0008	(0,0020)	- 0,0051 *	(0,0027)
	FSales&Markets x NMND_Guid	0,0715	(0,1171)	0,0942	(0,1666)
	Intercept	- 0,0016	(0,0299)	0,0957 *	(0,0523)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0021	(0,0016)	0,0077	(0,0051)
Firm level (unstructured)					
	Variance (FSales&Markets)	0,1293	(0,0389)	0,1689	(0,0611)
	Variance (_cons)	0,0214	(0,0032)	0,0676	(0,0087)
	Covariance (FSales&Markets, _cons)	0,0045	(0,0089)	0,0135	(0,0180)
	Variance (Residual)	0,0050	(0,0002)	0,0091	(0,0004)
Log likelihood		1 313,3		877,9	
Deviance		-2 626,7		-1 755,8	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets | countinuous predictors centered

Model 5-5.1:

$$DISC_{tij} = \gamma_{000} + \gamma_{100} Year_{tij} + \gamma_{200} Year\_sqr_{tij} + \gamma_{300} FS\&M_{tij} + \gamma_{400} FList_{tij} + \gamma_{010} Ind_{ij} +$$
$$+ \gamma_{001} Mand\_Guid_{j} + \gamma_{002} NMD\_Guid_{j} + \gamma_{003} NMND\_Guid_{j} +$$
$$+ \gamma_{101} Year_{tij} \times Mand\_Guid_{j} + \gamma_{301} FS\&M_{tij} \times Mand\_Guid_{j} +$$
$$+ \gamma_{102} Year_{tij} \times NMD\_Guid_{j} + \gamma_{302} FS\&M_{tij} \times NMD\_Guid_{j} +$$
$$+ \gamma_{103} Year_{tij} \times NMND\_Guid_{j} + \gamma_{303} FS\&M_{tij} \times NMND\_Guid_{j} +$$
$$+ \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j} + \mu_{3ij} FS\&M_{tij}$$

Model 5-5.3: Model 5-5.1 with $DQuant_{tij}$ (Quantitative disclosure index) as the dependent variable

Model 5-5.4: Model 5-5.1 with $DQualit_{tij}$ (Qualitative disclosure index) as the dependent variable

As mentioned before, disclosures on GHG emissions are critical in the sense that they convey information about activities having a negative impact on environment. Thus, under no guidance, firms operating in low carbon intensive industries do not have enough incentives to release voluntarily carbon financial disclosure because that would have meant bring out the pursuit of polluting activities, when they are not perceived as

severe pollutants by society, and institutional pressures to disclose are low. Otherwise, firms pertaining to more carbon intensive industries, subject to further scrutiny and public pressure due to their activities, tend to legitimize themselves by releasing voluntarily more information, but, as expected, the increase is more pronounced for qualitative (*soft*) disclosure (Table 5-13 | Model 5-5.4 | 0,2655, p<0,001), than for quantitative (*hard*) disclosure (Table 5-13 | Model 5-5.3 | 0,1363, p<0,001).

When examining the other three scenarios (Mand_Guid, NMD_Guid, NMND_Guid) disclosure levels are, on average, significantly higher than under no guidance, especially for qualitative disclosure (p<0,001). In particular, when considering the release of qualitative items (DQualit), under mandatory guidance, in 2005, the disclosure index (for low carbon intensive firms, listed only in domestic stock exchanges, and with average exposure to foreign markets) is expected to be higher, than under no guidance, by 0,6383 (p<0,001) (Table 5-13 | Model 5.5-4). As concerns to quantitative disclosure (DQuant), the difference (between mandatory guidance and no guidance) drops to 0,5511 (p<0,001) (Table 5-13 | Model 5.5-3). From an impression management standpoint (Oliver, 1991; Neu *et al.*, 1998), evidence seems consistent with the hypothesis of concealment strategies in response to the Resolution ICAC (2006). That is, in spite of enhancing the level of disclosure, mandatory guidance is far from ensuring full compliance, especially for quantitative-verifiable data containing more proprietary information. On the other hand, higher levels of disclosure for qualitative items than for quantitative items on GHG emission allowances, are in line with prior literature pointing out that firms exercise discretion under mandatory guidance, by selecting the information to be disclosed and ignoring the more demanding aspects of regulation that are not in their interest to expose.

Notwithstanding, comparisons between the scenarios of mandatory and not mandatory detailed guidance, reveal that, on average, under mandatory guidance, the disclosure of less informative items (DQualit) is expected to be higher by 0,1387 ((0,6383-0,4996), p<0,10) (Table 5-13 | Model 5.5-4), than among not mandatory detailed guidance, while the improvement in the disclosure index on more informative items (DQuant) rises to 0,3002 ((0,5511-0,2509), p<0,001) (Table 5-13 | Model 5.5-3). Similarly, comparisons between mandatory guidance and not mandatory guidance without detailed requests for

disclosure indicate upsurges of 0,3542 ((0,6383-0,2841), p<0,01) and 0,4747 ((0,5511-0,0764), p<0,001) for qualitative and quantitative items, respectively. So, although not ensuring full compliance, mandatory guidance seems to exert a significant "disciplinarian effect" on the dissemination of more quantitative-verifiable items precisely the kind of disclosure that firms are less willing to reveal as it conveys more proprietary information. On this view, findings confirm hypothesis H4 stating that the level of quantitative (*hard*) disclosure is likely to be higher among firms under mandatory guidance, than among firms under no mandatory regime on how to report GHG emission allowances in the annual accounts. These outcomes are important for regulatory bodies aimed at enhance utility and relevance of financial statements. It is essential that firms provide quantitative (monetary and non-monetary) disclosure on their efforts and achievements in reducing GHG emissions, namely to assist investors in assessing the trade-off between risk and return (Freedman and Jaggi, 2005, 2011), to provide the information that users need to project future cash flows (EFRAG, 2012), and to evaluate firms' environmental and financial performances. To this end, mandatory guidance is needed because, otherwise, the level of quantitative disclosure on GHG emission allowances is predicted to be significantly lower.

Hypothesis H5 examines whether affiliation in more carbon intensive and regulated industries is positively associated with the level of carbon financial disclosure. Estimation results strongly confirm this assumption. As discussed earlier, among all the firm-level predictors, variable representing affiliation in carbon intensive industries (Industry) is the one that added the major contribution in explaining within countries variance (step 2), and exhibits the strongest association with the level of disclosure. According to Model 5-5.1 (Table 5-12), the estimate for the coefficient of variable *Industry* suggests that, on average, the disclosure index for firms working in more carbon intensive industries is expected to be greater by 0,1863 (p<0,001), than for firms operating in less carbon intensive activities. Exploratory models developed in the intermediate steps of the analysis (with interaction terms between industry affiliation and type of guidance) confirm that this advantage stands for all the scenarios under review. Therefore, results allow the non-rejection of H5, admitting that more carbon intensive industries tend to publish higher levels of carbon financial disclosure.

These findings are in line with previous evidence from Cowan and Deegan (2011), and Choi *et al*. (2013), suggesting that in response to either increased social and political pressures or due to strict regulations, firms in high carbon intensive industries are more likely to provide additional disclosure on GHG emissions. In accordance with stakeholder theory, outcomes corroborate that, all else equal, firms perceived as high GHG emitters by society are more likely to use disclosure as a legitimizing tool in front of various stakeholders, namely providing more credible (quantitative-verifiable) information (Table 5-13 | Model 5.5-3 | 0,1363, $p<0,001$) than firms operating in low carbon intensive activities. Likewise, in the lens of institutional theory, the more an organization anticipates that conformity will enhance social fitness, the less a dismissal strategy is likely to occur. Results confirm this hypothesis suggesting that high carbon intensive firms (for which a greater legitimacy reward is perceived to be attainable from the conformity to mandatory or non-mandatory guidance on accounting for GHG emission allowances) are more likely to conform to institutional pressures (or, at least, disguise nonconformity), by means of higher levels of disclosure, than firms operating in less pollutant activities. In the same vein, according to agency theory and proprietary costs theory, high GHG emitters, facing a legitimacy threat due to their activities, have more to gain by providing voluntarily information on GHG emission allowances, and, in line with Diamond and Verrecchia's (1991) model, results confirm that, all else equal, high carbon intensive firms (with greater potential benefits from carbon financial disclosure) tend to disclose more.

Hypotheses H6 to H7b deal with the impact of firms' internationalization on the level of carbon financial disclosure.

With regard to internationalization through the capital markets (H6), the non-significant estimate for the coefficient of variable *FListing* (Table 5-12 | Model 5.5-1) means that, under no guidance, foreign listed firms are not associated with higher levels of carbon financial disclosure. Additionally, exploratory models developed in the intermediate steps of the analysis (with interaction terms between listing status and type of guidance) indicate that there are no significant differences in the disclosure index between foreign listed firms and domestic listed firms, for all the scenarios under consideration. Consequently, evidence does not support hypothesis H6 stating that the level of carbon

financial disclosure is likely to be higher among foreign listed firms, than among firms registered only in domestic stock exchanges.

These results are not dissenting from the assumption made by, amongst other, Thorell and Whittington (1994), and Cormier *et al*. (2005), that a positive or a negative relationship between internationalization and level of disclosure may be expected, depending on the relative degree of environmental awareness in home-country and in those foreign markets to which the firm is exposed. Actually, in line with Jackson and Apostolakou (2010), evidence from this study suggests that, for EU-15 sample firms, internationalization may not be a significant driver of carbon financial disclosure, since the vast majority of multi-listed firms in the sample are registered in US stock exchanges, a country that did not ratified the Kyoto Protocol, and where there was a lack of specific accounting guidance on how to report GHG emission allowances in the annual accounts, over the research period. In view of this, despite the exposure to a broader range of stakeholders, EU-15 firms listed in US stock exchanges are not deemed to face additional pressure to enhance carbon financial disclosure.

Considering the internationalization through the markets of products and services where customers are located, the non-significant estimate for the coefficient of variable *FSales&Markets* (Table 5-12 | Model 5.5-1) means that, under no guidance, international exposure exerts no direct influence on the level of carbon financial disclosure. Thus far, evidence does not support hypothesis H7a stating that, *ceteris paribus*, the level of disclosure on GHG emission allowances in the annual accounts is likely to be higher among firms with greater exposure to foreign markets, than among firms operating mainly in domestic markets. Notwithstanding, estimation results allow admitting that the association between the level of disclosure and the exposure to foreign markets is intermediate by the type of guidance in firms' home-country. In particular, according to the interaction term *FSales&Markets* x *NMD_Guid* (Table 5-12 | Model 5.5-1), under not mandatory detailed guidance, a further increase in the disclosure index is estimated at 0,4672 percentage points ($p<0,01$) for every percentage point of increase in the level of exposure to foreign markets.

As underlined when analyzing hypotheses H1 to H3, results are consistent with prior research (Criado-Jiménez *et al*., 2008; da Silva Monteiro and Aibar-Guzmán, 2010)

stating that formal guidance, though not mandatory for firms under IFRS, encourages additional disclosure most probably because it is likely to attract the attention of more powerful stakeholders. Furthermore, findings indicate that the overall effect depends on the clearness with which the items to be reported are delineated. Again, the small and non-significant estimate for the interaction term *FSales&Markets* x *NMND_Guid* (Table 5-12 | Model 5.5-1) confirms that, as regards the difference between more or less internationalized firms, there are no significant changes when comparing the scenario of no guidance with the scenario where not mandatory guidance does not specify disclosure items. Also, according to the estimate of the interaction term *FSales&Markets* x *Mand_Guid* (Table 5-12 | Model 5.5-1), when considering the case of mandatory guidance, there are no significant changes in the level of disclosure, as regards the difference between high and low exposure to foreign markets. Accordingly, evidence suggests that only the scenario of not mandatory guidance comprehending detailed items to be reported in the annex trigger a positive relationship between the degree of internationalization and the level of carbon financial disclosure. Therefore, results support hypothesis H7b stating that the increment in the level of disclosure of firms with larger exposure to foreign markets, when compared with firms operating mainly in domestic markets, is predicted to be higher under not mandatory detailed guidance, than under any other type of guidance in home-country on how to report GHG emission allowances in the annual accounts.

In summary, thus far, outcomes indicate that mandatory guidance is associated with the major upward movement of the disclosure index (0,5633, $p<0,001$), for any degree of international exposure, whereas not mandatory detailed guidance trigger additional disclosure for firms with larger exposure to foreign markets (Table 5-12 | Model 5.5-1). Namely, when compared with the scenario of no guidance on how to report GHG emission allowances in the annual accounts, not mandatory detailed guidance is associated with an upward movement of the disclosure index by 0,3599 ($p<0,001$) for firms with average exposure to foreign markets, and an additional increase (decrease) of 0,4672 percentage points ($p<0,01$) for every percentage point of increase (decrease) in the degree of exposure to foreign markets.

Notwithstanding, a more in-depth analysis reveals that, under not mandatory detailed

guidance, the increased level of disclosure of the most internationalized firms only applies to qualitative disclosure. According to Model 5-5.4 (Table 5-13), when considering the release of qualitative items (DQualit), the interaction term *FSales&Markets* x *NMD_Guid* indicates that international exposure is significantly associated with higher levels of release (0,7652, p<0,01). Otherwise, as regards quantitative data (DQuant), estimation results coming from Model 5-5.3 (Table 5-13) indicate that the interaction term *FSales&Markets* x *NMD_Guid* is not statistically significant.

Furthermore, under mandatory guidance (where, on average, levels of disclosure are the highest among all the scenarios under review), outcomes suggest that firms with greater exposure to foreign markets, although not providing a greater level of disclosure, tend to differentiate themselves by providing significantly more (0,3076, p<0,05) quantitative information, as indicated by the interaction term *FSales&Markets* x *Mand_Guid* in Model 5.5-3 (Table 5-13). That is, when considering the nature of disclosure, outcomes point out that, under not mandatory detailed guidance, firms operating internationally tend to provide more qualitative disclosure while under mandatory guidance are more likely to enhance quantitative disclosure. On one hand, outcomes confirm that disclosure strategies biased towards less informative items are more likely to occur under not mandatory guidance, than under mandatory guidance. On the other hand, findings allow to admit that the overall improvement on carbon financial disclosure among firms operating on the international stage seems to be triggered by guidance in firms' home-country.

Altogether, results indicate that internationalization through sales is not likely to exert, *de per se*, a significant "disciplinarian effect" on the level of carbon financial disclosure. In this regard, it should be noted that it was not possible to accurately identify the characteristics of the target markets of each of the firms in the sample, namely in terms of their adherence to the Kyoto Protocol and accounting guidance on GHG emission allowances, because firms' disclosure on operating segments is often aggregate by regions or continents instead of single countries. Nevertheless, most of sample firms operate in other EU-15 countries that have ratified the Protocol and issued guidance on accounting for GHG emission allowances. As a result, it would be plausible to admit

that, for firms under no guidance in home-country, internationalization through sales would be associated with more pressure to disclose coming from foreign stakeholders in countries where information on GHG emissions is more encouraged or valued. However, consistent with evidence provided earlier by Freedman and Jaggi (2005, 2011), this study supports that multinational firms may not have strong incentives to make further disclosure on GHG emission allowances unless such information is recommended, or requested, by the country of their home-office.

In the lens of institutional theory (Oliver, 1991), the lack of international consensus regarding either the commitment to the Kyoto Protocol or the appropriate accounting model for GHG emission allowances, do not favor a process of voluntary release of costs of carbon by EU-15 multinational firms. Despite the worldwide public concern over climate change and the need to limit GHG emissions, some skepticism has surrounded Protocol's application namely due to the heavier burden it imposes on the developed countries. As advanced by Drezner (2001, p. 74), "objections in the US about the Kyoto Protocol's costs of implementation, the distribution of costs (between countries), and the lack of enforcement measures have made implementation unlikely".

Moreover, Canada, a country that was active in the negotiations that led to the Kyoto Protocol in 1997, decided to withdraw in 2012. Two key motives were invoked by the Government of Canada. The first was primarily tied to economic reasons. Canada's Kyoto target was a 6% reduction of GHG emissions by 2012 compared to 1990 (base year) levels. However, during this period an increased by more than 18% has occurred. As a consequence, the Government of Canada argue that "To fulfill its obligations under the Protocol, Canada would have had to purchase a significant and costly amount of international credits using funds that could be invested here, in Canada, on domestic priorities, including the environment"[8]. The second reason was mainly political in nature and calls into question the effectiveness of the Protocol: "From an environmental perspective, the Kyoto Protocol has not served the international community well in meeting the real challenges of global climate change or effectively engaging all major economies. The Protocol only covers countries responsible for a small, and increasingly

[8] Statement available on the official web site of the Government of Canada, http://www.ec.gc.ca/Publications/default.asp?lang=En&n=EE4F06AE-1&xml=EE4F06AE-13EF-453B-B633-FCB3BAECEB4F&offset=3&toc=show. Last accessed on 19 July 2014.

smaller, percentage of global emissions and, as a consequence, is not an effective vehicle for addressing the global challenge of climate change. Importantly for Canada, the United States, which is Canada's biggest economic trading partner and is responsible for nearly 20% of global emissions, is not covered by the Kyoto Protocol"[9]. In the same vein, the Pew Center on Global Climate Change (2009, p. 1) claims that an effective global strategy would require "leadership by the US, and commitments and action by the world's major economies".

As formulated by Oliver (1991), when rules or norms are not broadly diffused and supported by society, organizations are less likely to respond to institutional pressures because their social validity is questioned. Extending Oliver's (1991) hypotheses to an international environment, the absence of generally accepted beliefs regarding GHG emissions trading schemes and their appropriate accounting framework, at international level, implies that a wider range of foreign stakeholders does not necessarily compel EU-15 firms acting globally to voluntarily enhance disclosure on GHG emission allowances. In these circumstances, this study suggests that only national guidance in the firm's home-country is capable to trigger a positive relationship between internationalization and disclosure. On this view, outcomes indicate that, with regard to carbon financial disclosure, two different institutional levels may be identified as exerting different degrees of incentives and pressures on EU-15 firms to disclose costs of carbon, as summarized in Table 5-14.

The first is the national level where the signature of the Kyoto Protocol, the implementation of EU-ETS ("the world's most far-reaching GHG reduction policy", Pew Center on Global Climate Change, 2009, p. 5), may be perceived by EU-15 firms as meaning that carbon financial disclosure is valued by society, and, therefore, is more likely to be used as a legitimization tool in order to feat social expectations.

The second is the international level where, due to the lack of consensus regarding the commitment to the Kyoto Protocol and the absence of generally accepted guidance on accounting for GHG emissions trading schemes, the expectations of a multiplicity of

[9] Statement available on the official web site of the Government of Canada, http://www.ec.gc.ca/Publications/default.asp?lang=En&n=EE4F06AE-1&xml=EE4F06AE-13EF-453B-B633-FCB3BAECEB4F&offset=3&toc=show. Last accessed on 19 July 2014.

foreign constituents may be perceived as fragmented and less consistent than domestic constraints and, consequently, are not able to put forth, by themselves, further pressure on EU-15 firms exposed to external markets to enhance carbon financial disclosure.

Table 5-14: Disclosure strategies of EU-15 firms operating in foreign markets

International environment (2005 – 2012)	Type of guidance in home-country	Strategic responses of EU-15 firms operating in foreign markets
FRAGMENTED **VALUES, NORMS, AND PRACTICES** regarding the commitment to the Kyoto Protocol and specific accounting guidance to report emissions trading schemes are **NOT BROADLY DIFFUSED OR WIDELY VALIDATED** among host countries.	No Guidance Not Mandatory Not Detailed	**ORGANIZATIONAL SKEPTICISM** about the strategic utility of carbon financial disclosure as a tool to manage a multiplicity of foreign stakeholders **INHIBITS IMPROVEMENT**.
	Not Mandatory Detailed	**GUIDANCE FAVORS** the improvement of the overall level of disclosure by means of more **QUALITATIVE DISCLOSURE**.
	Mandatory	**GUIDANCE FAVORS** the improvement of disclosure by means of more **QUANTITATIVE DISCLOSURE**, although not enhancing the overall level of disclosure.

On one hand, where national guidance was issued, institutional pressures for EU-15 firms (to control GHG emissions and to disclose costs of carbon) tend to be more pronounced at domestic level than internationally. So, foreign sales are not likely to exert, *de per se*, a significant "disciplinarian effect" on the level of disclosure, and ultimately the likelihood of EU-15 firms to respond to a multiplicity of foreign stakeholders with further carbon financial disclosure is triggered by guidance in firm's home-country. In view of greater organizational dependencies from national authorities as regards the allocation of (free) allowances, the control of actual GHG emissions, and the definition of reduction targets, findings are consistent with Oliver's (1991) prediction that, when facing a multiplicity of foreign constituents, organizations will be expected to acquiesce more readily to institutional pressures when the organization is greatly dependent on the source of these pressures. Also, in accordance with stakeholder theory, EU-15 firms acting globally are expected to conform primarily to domestic constraints especially when detailed requests are set out by local guidance and, therefore, further stakeholders' pressure is perceived and greater legitimacy rewards are attainable, at national level.

In turn, when there is no specific guidance in the firm's home-country or when existing

guidelines do not specify disclosure items, the lack of international consensus as regards the commitment to the Kyoto Protocol and the divergent positions of regulatory bodies concerning the need for a specific accounting model for emissions trading schemes seem to lead to *organizational skepticism* (Oliver, 1991, p. 159) about the strategic utility of carbon financial disclosure as a tool to manage a multiplicity of foreign stakeholders.

In summary, considering all the above mentioned outcomes about the impact of firms' internationalization over the level of carbon financial disclosure, evidence allows to admit that, for EU-15 firms engaged in internationalization processes, the type of guidance in home-country and the nature of international pressures when compared with domestic constraints are predictive factors of carbon financial disclosure, as summarized in Table 5-15.

With regard to the internationalization through the capital markets, for EU-15 firms (domiciled in countries that signed the Kyoto Protocol) the internationalization through the quotation in US stock exchanges (a country that has not ratified the Protocol) does not seem to exert further pressure (in addition to the existing in firms' home-country) to release carbon financial disclosure.

In the lens of stakeholder theory and institutional theory, results suggest that, as foreign listed firms realize that this particular information is not broadly valued by their foreign stakeholders, to be accountable to a wider stakeholder audience is not enough to motivate, by itself, higher levels of disclosure on GHG emission allowances. Accordingly, as international pressures coming from the host country (US) are lower than domestic constraints, internationalization is not likely to exert, *de per se*, a significant "disciplinarian effect" over the level of disclosure, and evidence corroborates that disclosure strategies of EU-15 firms listed abroad are not significantly different from those of EU-15 firms listed only in domestic stock exchanges.

As regards the internationalization through sales, evidence allows admitting that international pressures to disclose costs of carbon are not perceived by firms as more convincing than domestic constraints, due to multiplicity and fragmentation of foreign constituents. Extending the hypotheses formulated by Oliver (1991) to an international

environment, EU-15 firms operating globally are expected to respond primarily to domestic institutional pressures from which (perceived) organizational dependencies are predicted to be higher, namely as regards the allocation of (free) allowances and the control of GHG emissions. Therefore, their disclosure strategies are primarily driven by guidance in home-country, and follow general patterns of disclosure identified earlier. That is, under not mandatory detailed guidance the improvement is more likely to occur by means of more qualitative disclosure while the release of quantitative disclosure is more likely to occur under mandatory guidance.

Table 5-15: Disclosure strategies of EU-15 firms engaged in internationalization processes

Internationalization	**Through capital markets** (due to the quotation mainly in US stock exchanges) ⇩	**Through foreign sales** (due to intensity of foreign sales and variety of foreign markets) ⇩
International pressures to disclose costs of carbon when compared with domestic constraints	For EU-15 firms listed in US stock markets (a country that did not ratified the Kyoto Protocol, and where there is a lack of specific accounting guidance on emissions trading schemes), international pressures coming from the host country (US) are **LOWER** than domestic constraints. ⇩	For EU-15 firms operating globally, international pressures are **FRAGMENTED** as values, norms and practices concerning either the commitment to the Kyoto Protocol or specific accounting guidance for emissions trading schemes are not broadly diffused or widely validated among host countries. ⇩
Disclosure strategies of EU-15 firms engaged in internationalization processes	When international pressures are LOWER than domestic constraints, internationalization through the capital market is not likely to exert, *de per se*, a significant "disciplinarian effect" on the level of disclosure. ⇩	When international pressures are FRAGMENTED, internationalization through sales is not likely to exert, *de per se*, a significant "disciplinarian effect" on the level of disclosure, being that strategic responses are primarily driven by domestic constraints from which (perceived) organizational dependencies are predicted to be higher. ⇩
	Hence, disclosure strategies of EU-15 firms listed abroad are **NOT SIGNIFICANTLY DIFFERENT** from those of EU-15 firms listed only in domestic stock exchanges.	Hence, disclosure strategies of EU-15 firms with higher exposure to foreign markets are **TRIGGERED BY GUIDANCE IN HOME-COUNTRY**, and follow general patterns of disclosure: Not Mandatory Detailed Guidance tends to encourage more qualitative disclosure, while Mandatory Guidance is more likely to enhance quantitative disclosure.

Final synthesis

Next table summarizes main results on the effects of regulatory background, affiliation in carbon intensive industries, and exposure to foreign markets, over mandatory or voluntary disclosure on GHG emission allowances in the annual accounts of EU-15 listed firms.

Table 5-16: Summary of results on the "disciplinarian effect" of standards and markets on the level of carbon financial disclosure

Explanatory Variables | Hypotheses	Predicted sign	No Guidance Scenario A	Not-Mandatory Not-Detailed Scenario B1	Not-Mandatory Detailed Scenario B2	Mandatory Guidance Scenario C
		Results on the association with the overall disclosure index (DISC)			
Guidance | H1 H2 H3	+	Not significant	√√	√√	√√
Industry | H5	+	√√	√√	√√	√√
Internationalization					
Foreign-Listing | H6	+	(i) Not significant	(i) Not significant	(i) Not significant	(i) Not significant
Foreign Sales & Markets | H7a H7b	+	(ii) Not significant	(ii) Not significant	√	(ii) Not significant
		Results on the association with the disclosure index on quantitative data (DQuant)			
Guidance | H4	+	Not significant	√–	√√	√√
Industry		√√	√√	√√	√√
Internationalization					
Foreign Sales & Markets		(ii) Not significant	(ii) Not significant	(ii) Not significant	√
		Results on the association with the disclosure index on qualitative data (DQualit)			
Guidance	+	√–	√√	√√	√√
Industry		√√	√√	√√	√√
Internationalization					
Foreign Sales & Markets		(ii) Not significant	(ii) Not significant	√√	(ii) Not significant

√√ Estimation results confirm association and predicted sign ($p<0,01$).
√ Estimation results confirm association and predicted sign ($p<0,05$).
√– Estimation results confirm association and predicted sign ($p<0,10$).
(i) On average, the differences between the level of disclosure for firms listed in foreign stock exchanges and firms listed only in domestic markets are not significant.
(ii) On average, the differences between the level of disclosure for firms with higher exposure to foreign markets and firms with lower exposure to foreign markets are not significant.

6. Evaluating the "disciplinarian effect" of standards and markets on *de facto* accounting harmonization in carbon financial disclosure

This chapter provides empirical evidence aiming at evaluate whether formal guidance or the internationalization of firms lead to de facto accounting harmonization in carbon financial disclosure.

6.1. Introduction

Prior literature on international accounting harmonization suggests that, in general, harmonization of practices may arise from two different forces: institutional accomplishments to harmonize international financial reporting standards; and, voluntary movements by firms towards similar practices, independently from the harmonization of accounting regulations.

As discussed in previous chapter, although not ensuring full compliance, formal guidance on how to report GHG emission allowances in the annual accounts is a significant driver of additional disclosure. Given that comparability is an essential condition for the information to be useful, this study will now attempt to evaluate the effectiveness of such guidance in promoting *de facto* (material) accounting harmonization of carbon financial disclosure, by comparing levels of harmony among firms under mandatory guidance in home-country, with levels of harmony among firms under no mandatory regime.

With regard to the internationalization of firms, in general, the results discussed in previous chapter do not allow admitting its association with additional disclosure. However, internationalization is sometimes pointed out in related literature as a possible driver of voluntary harmonization, on the grounds that firms operating internationally tend to adopt disclosure practices that improve communication with users in several countries. With this in mind, the present investigation intends to evaluate if, despite not enhancing the level of disclosure, the globalization of capital markets and the internationalization of firms' operations are features associated with a minimum of comparable information on GHG emission allowances in the annual accounts.

In summary, the aim of present research is twofold: to confirm the existence of a

"disciplinarian effect" of formal guidance; and, to test the existence of a "disciplinarian effect" of markets, both concerning harmonization in carbon financial disclosure. The remainder of this chapter is organized as follows. Section 6.2 formalizes hypotheses for investigation. Section 6.3 describes data and research methodology. The final section presents and discusses empirical results.

6.2. Hypotheses

The harmonization of practices through the harmonization of accounting standards is one goal of regulatory bodies. When this aim is achieved *de jure* (formal) harmonization leads to *de facto* (material) harmonization. But the existence of formal harmonization does not assure, by itself, the comparability of accounting information (van der Tas, 1992; Emenyonu and Gray, 1992; Emenyonu, 1993; Cairns, 1997; Emenyonu and Adhikari, 1998; Nobes, 1998; Ali and Hwang, 2000; Ball *et al*., 2000; Ball *et al*., 2003; Barbu *et al*., 2014). Even when compliance with regulations is legally required, firms may not comply if it is perceived that the consequences of non-compliance are not serious (Tay and Parker, 1990; Oliver, 1991). So, the diversity of practices may subsist despite the existence of standardized rules. Moreover, formal harmonization may lead to material disharmonization (Archer *et al*., 1995; Aisbitt, 2001) especially when standards evolve allowing for more options or when mandatory disclosure depends on the management evaluation as to materiality (Lainez *et al*., 1999; Cole *et al*., 2012).

Notwithstanding, the more institutional pressures to disclose are "entrenched in a legal or regulatory apparatus" (Oliver, 1991, pp. 167-168), the less likely it is that organizations will resist to those pressures. In particular, by emphasizing benchmarks for disclosure, mandatory guidance makes organizations more aware of public interests and less likely to respond defiantly because the consequences of withholding information are more tangible and often more severe, than under no mandatory regime. In view of greater incentives for firms to comply with compulsory requests, more comparable information is expected under mandatory guidance, than under no mandatory regime. Hence, in line with institutional theory, this study anticipates that mandatory guidance is more likely to enhance harmony in carbon financial disclosure, than any other type of regulatory background under consideration (not mandatory guidance or no guidance), as formulated in the following hypothesis:

H1: *The level of harmony in carbon financial disclosure is predicted to be higher among firms under mandatory guidance on accounting for GHG emission allowances, than among firms under no mandatory regime.*

As regards voluntary disclosure, in line with da Silva Monteiro and Aibar-Guzmán (2010), Choi *et al*. (2013), and Barbu *et al*. (2014), the results in previous chapter suggest that national guidance not required for entities under IFRS exerts a positive effect on the firms' level of disclosure on GHG emission allowances in their annual accounts. Matters now assess whether, under not mandatory guidance, increased levels of carbon financial disclosure are accompanied by greater harmony of firms' accounts or if, on the contrary, they are associated with greater dispersion, namely because, in view of impression management strategies, firms tend to disclose only those aspects that are in line with the interests of their most powerful stakeholders, and conceal those that aren't of interest to reveal.

Previous research (Rahman *et al*., 2002) on *de facto* (material) disclosure harmony predicted that, in general, high levels of voluntary disclosure tend to be associated with lower levels of harmony in disclosure. However, according to stakeholder theory, due to legitimacy-seeking behaviors, firms under IFRS are compelled to reveal as much information as their competitors, namely those applying local guidance. Moreover, from institutional theory standpoint, when an organization anticipates that conformity with social expectations (even though set out by non-mandatory rules) will enhance social fitness, voluntary diffusion, through imitation, is more likely to occur, than under no guidance (Oliver, 1991). So, in line with stakeholder theory and institutional theory, this study anticipates that higher levels of harmony are expected among firms domiciled in countries where formal guidance was issued, though not mandatory for entities under IFRS, than among firms domiciled in countries where no guidance on accounting for GHG emission allowances was provided, as formulated in the following hypothesis:

H2: *The level of harmony in carbon financial disclosure is predicted to be higher among firms domiciled in countries where national guidance on accounting for GHG emission allowances was issued, though not mandatory for entities under IFRS, than among firms domiciled in countries where no specific guidance was provided.*

Furthermore, as regards not mandatory guidance, outcomes from previous chapter suggest that guidance comprehending detailed benchmarks for the items to be reported are more likely to enhance the level of carbon financial disclosure, than not mandatory guidance that does not specify detailed demands for disclosure. In line with stakeholder theory and institutional theory, national guidance establishing detailed benchmarks for disclosure, though not mandatory, make organizations more aware of social expectations, help to inform the public opinion on disclosure best practices, and contribute to raise awareness among stakeholders about the relevant information to be provided in the annual accounts. Moreover, detailed benchmarks are likely to boost stakeholders' perception that lack of critical information may well correspond to bad news. As a consequence, by exerting further pressure for the release of a particular information (specific items), detailed guidance is more likely to reduce management discretion than guidance without detailed demands for disclosure. Hence, this study anticipates higher levels of harmony in carbon financial disclosure under not mandatory detailed guidance, than under not mandatory guidance that does not specify detailed demands for disclosure, as formulated in the following hypothesis:

H3: *The level of harmony in carbon financial disclosure is predicted to be higher among firms domiciled in countries where national guidance on accounting for GHG emission allowances, though not mandatory for entities under IFRS, comprises detailed requests for disclosure, than among firms domiciled in countries where not mandatory guidance does not specify detailed requests for disclosure.*

The non-rejection of hypotheses H1 to H3 would confirm that formal guidance, even not mandatory for entities under IFRS, exerts a "disciplinarian effect" over the harmony in carbon financial disclosure.

Another sort of regulatory influence may come from industry affiliation. Within EU-ETS, the EC has adopted guidelines for the monitoring and reporting of GHG emissions according to which firms have to report their actual emissions and assure independent verification of their reports (refer to section 2.1). In addition, high GHG emitters, such as power generators, face further sector-level regulations addressing GHG emissions due to its operations. Hence, due to greater scrutiny and institutional pressure, this study anticipates that when there is no mandatory regime on accounting for GHG emission

allowances, higher levels of harmony are more likely to occur among more carbon intensive industries, than among less pollutant activities. Also, harmony in disclosure is more likely to occur at industry level because firms operating in the same industry face common legitimization challenges, are affected by similar sector-level regulations, and tend to imitate competitors' behavior either at national or international level (Jackson and Apostolakou, 2010). Accordingly, the following hypotheses are put forward:

H4a: *In the context of no mandatory guidance on accounting for GHG emission allowances, the level of harmony in carbon financial disclosure is predicted to be higher among firms operating in more carbon intensive industries, than among other firms.*

H4b: *In the context of no mandatory guidance on accounting for GHG emission allowances, the level of harmony in carbon financial disclosure is predicted to be higher within industries, than between industries.*

On the other hand, the lack of formal guidance does not necessarily imply the diversity of practices. Some research (van der Tas, 1988; Tay and Parker, 1990; Cañibano and Mora, 2000; Aisbitt, 2001) suggests that convergence of practices may occur by means of voluntary harmonization when most firms consider that it is of their convenience. Namely, the globalization of capital markets and the internationalization of firms' operations are singled out in the literature as factors that may lead to voluntary harmonization. In this regard it should be noted that past research shows mixed results (Emenyonu, 1993; Thorell and Whittington, 1994; Emenyonu and Gray, 1996; Emenyonu and Adhikari, 1998; Land and Lang, 2002; Cañibano and Mora, 2000; Jaafar and McLeay, 2007), and findings discussed in previous chapter do not identify internationalization, by itself, as a significant determinant of the level of carbon financial disclosure.

However, despite not enhancing the level of disclosure, the internationalization of firms' operations may induce, at least, a minimum of comparable information. The rationale is that firms operating globally are likely to disclose at least as much information as their competitors, and due to legitimacy-seeking behaviors all of them are willing to improve communication with users in several countries. Therefore, to

evaluate whether international exposure is likely to enact harmony in carbon financial disclosure, either the internationalization through the capital markets or through foreign sales are considered.

First, to investigate the existence of a "disciplinarian effect" of capital markets on harmony in carbon financial disclosure, the following two hypotheses are proposed:

H5a: *In the context of no mandatory guidance on accounting for GHG emission allowances, the level of harmony in carbon financial disclosure is predicted to be higher among foreign listed firms, than among firms listed only in domestic stock exchanges*.

H5b: *In the context of no mandatory guidance on accounting for GHG emission allowances, the level of harmony in carbon financial disclosure increases over time among foreign listed firms, as they converge to best disclosure practices*.

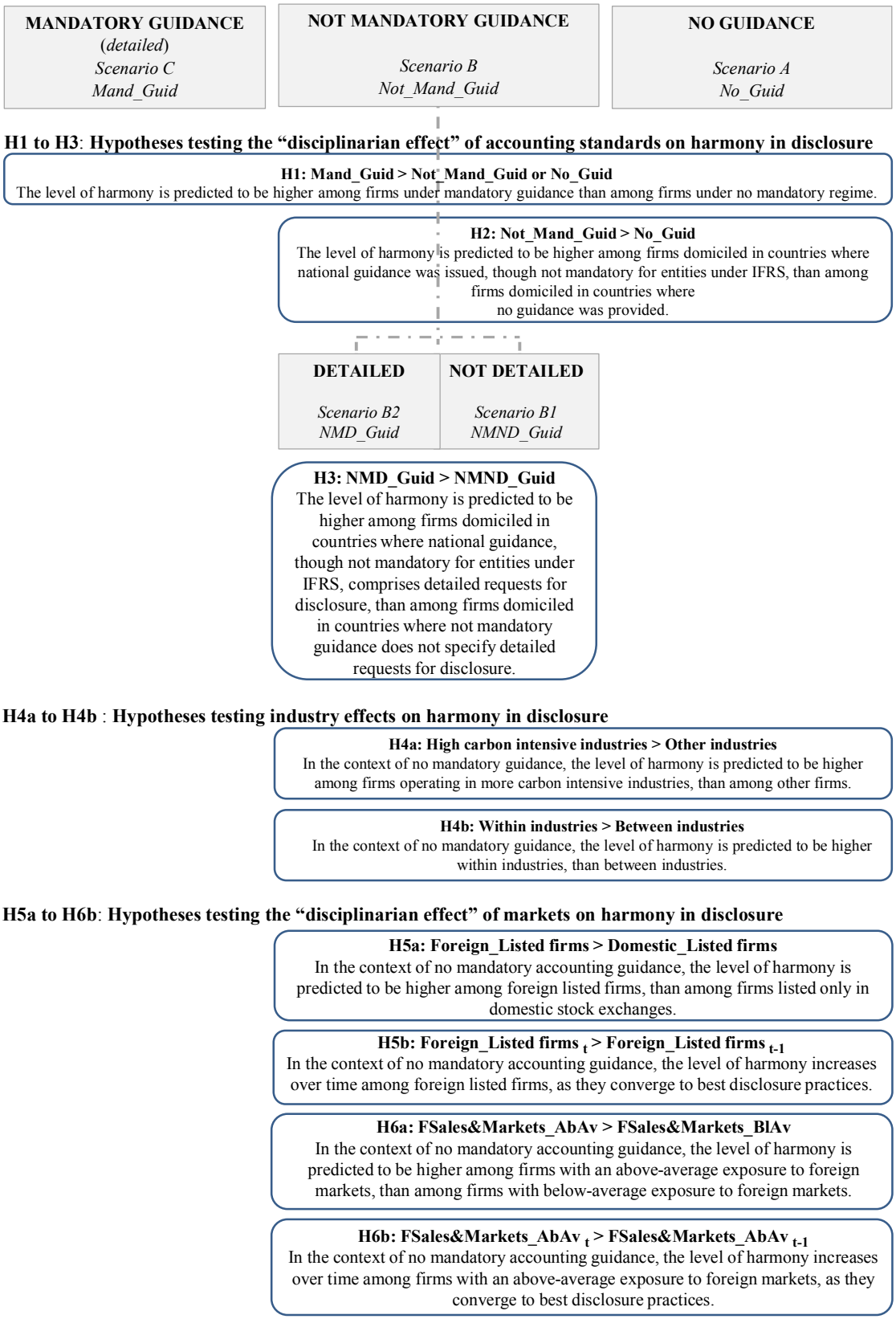
Then, to investigate the existence of a "disciplinarian effect" coming from the markets of products and services to which the firm is exposed when operating internationally, the following two hypotheses are proposed:

H6a: *Considering firms not listed on foreign stock exchanges, in the context of no mandatory guidance on accounting for GHG emission allowances, the level of harmony in carbon financial disclosure is predicted to be higher among firms with above-average exposure to foreign markets, than among firms with below-average exposure to foreign markets.*

H6b: *Considering firms not listed on foreign stock exchanges, in the context of no mandatory guidance on accounting for GHG emission allowances, the level of harmony in carbon financial disclosure increases over time among firms with above-average exposure to foreign markets, as they converge to best disclosure practices.*

The non-rejection of hypotheses H5a to H6b would suggest that, even without mandatory guidance on how to report GHG emission allowances in the annual accounts, harmony in carbon financial disclosure may be induced by means of a "disciplinarian effect" of markets.

Figure 6-1: Synthesis of the hypotheses testing the "disciplinarian effect" of standards and markets on the harmony in carbon financial disclosure



6.3. Data and method

6.3.1. Sample

As described in section 5.3.1, the final sample comprises 168 listed firms from fourteen EU countries, and research covers an eight-year period, from 2005 to 2012, amounting to 1 344 firm-year observations.

For the purpose of confirming the "disciplinarian effect" of formal guidance on *de facto* (material) disclosure harmony, sample firms were classified according to the same two criteria followed in previous chapter (Table 5.3). The first one comprehends three categories (no guidance, not mandatory guidance, and mandatory guidance). The second makes a distinction between detailed and not-detailed guidance on disclosure items, arriving at four groups (no guidance, not mandatory not detailed guidance, not mandatory detailed guidance, and mandatory (detailed) guidance).

Then, for the purpose of testing a possible "disciplinarian effect" of markets on *de facto* (material) disclosure harmony, those 146 sample firms under no mandatory regime were organized according two dimensions: entities acting on the international stage (i) through the capital markets, according to the firm's listing status; or, (ii) through the markets of products and services rendered by each firm, according to the geographical location of its customers. Concerning the listing status, 26 firms whose shares were listed in more than one stock exchange, the domestic and at least one foreign stock market, were classified as foreign listed (Table 6-1 | Foreign-Listed), irrespective of their percentage of sales to external markets. Regarding the internationalization of the firms' operations through foreign sales, the classification of the remaining 120 firms was based on both the intensity of sales outside the country of domicile of each firm and the variety of markets where its foreign customers are located. This procedure intends to overcome the fact that the percentage of foreign sales does not capture, *de per se*, the diversity of markets to which the firm is exposed. So, the level of internationalization was evaluated through a composite measure weighting the percentage of sales to foreign markets by the relative number of foreign reportable geographical segments, for each firm (arriving at variable Foreign Sales & Markets described earlier in Table 5-7). Subsequently, these 120 firms listed only in domestic markets were classified in two different categories depending on whether their level of internationalization was higher

or lower to the sample average, throughout the eight-year period. Table 6-1 summarizes sample composition according to the aforementioned criteria (Panel A) and shows the descriptive statistics by type of guidance, listing status and level of internationalization (Panel B).

Table 6-1: Sample composition and descriptive statistics by type of guidance, listing status, and internationalization through sales

PANEL A			PANEL B				
Firm-year observations		%	Variable	Mean	Std. Dev.	Min	Max
Mandatory Guidance	**176**	**13,1**	Foreign Sales (%)	52,3	19,7	10,0	94,0
			Foreign Sales & Markets (%)	27,9	16,1	6,0	91,0
			Foreign Sales & Markets_average (%)	27,9	15,0	9,3	80,9
			Assets (M€)	13 811	22 805	113	97 016
			LnAssets	7,9	1,9	4,7	11,5
			Turnover (M€)	7 015	12 672	62	57 740
			LnTurnover	7,4	1,8	4,1	11,0
			Return on Assets (%)	3,5	4,9	(28,7)	14,5
			Leverage	2,1	1,8	0,3	10,6
No Mandatory Guidance							
Foreign-Listed	**208**	**15,5**	Foreign Sales (%)	84,7	13,2	43,0	99,0
			Foreign Sales & Markets (%)	65,6	21,2	9,8	99,0
			Foreign Sales & Markets_average (%)	65,6	21,2	11,7	99,0
			Assets (M€)	71 903	71 643	4 446	369 992
			LnAssets	10,7	1,0	8,1	12,8
			Turnover (M€)	61 025	81 629	2 134	470 171
			LnTurnover	10,4	1,1	7,7	13,1
			Return on Assets (%)	6,5	5,8	(21,9)	23,3
			Leverage	2,29	1,63	0,45	10,2
FSales&Markets_Above Average	**480**	**35,7**	Foreign Sales (%)	85,2	11,2	27,0	99,0
			Foreign Sales & Markets (%)	69,2	12,3	21,6	95,0
			Foreign Sales & Markets_average (%)	69,2	11,4	51,7	95,0
			Assets (M€)	16 319	23 234	149	142 945
			LnAssets	8,9	1,4	5,0	11,9
			Turnover (M€)	11 984	16 940	185	127 220
			LnTurnover	8,6	1,3	5,2	11,8
			Return on Assets (%)	4,7	5,9	(42,1)	32,6
			Leverage	1,9	1,4	0,3	11,1
FSales&Markets_Below Average	**480**	**35,7**	Foreign Sales (%)	49,5	27,1	0,0	93,0
			Foreign Sales & Markets (%)	23,0	14,9	0,0	65,0
			Foreign Sales & Markets_average (%)	23,0	14,3	0,0	47,9
			Assets (M€)	16 115	39 552	59	256 906
			LnAssets	8,1	1,7	4,1	12,4
			Turnover (M€)	9 189	16 832	85	132 093
			LnTurnover	8,0	1,6	4,4	11,6
			Return on Assets (%)	3,9	6,3	(33,3)	26,9
			Leverage	3,1	6,6	0,2	116,9
Full sample	**1 344**	**100,0**	Foreign Sales (%)	68,1	26,2	0,0	99,0
			Foreign Sales & Markets (%)	46,7	26,8	0,0	99,0
			Foreign Sales & Markets_average (%)	46,7	26,5	0,0	99,0
			Assets (M€)	24 528	44 960	59	369 992
			LnAssets	8,8	1,8	4,1	12,8
			Turnover (M€)	17 925	39 932	62	470 171
			LnTurnover	8,5	1,7	4,1	13,1
			Return on Assets (%)	4,6	6,0	(42,1)	32,6
			Leverage	2,4	4,2	0,2	116,9

In summary, combining listing status and level of international activity, three categories are considered to group those sample firms under no mandatory guidance on how to report GHG emission allowances in the annual accounts. The first group comprises 26 firms listed in both domestic and foreign stock exchanges (Table 6-1 | Foreign-Listed), totaling 208 firm-year observations. The second group comprehends 60 firms listed only in domestic markets and whose level of internationalization, over the eight-year period, is above the sample average (Table 6-1 | FSales&Markets_Above Average), totaling 480 firm-year observations. Finally, the third group consists of 60 domestic listed firms whose level of internationalization, over the eight-year period, is lower than the sample average (Table 6-1 | FSales&Markets_Below Average), totaling 480 firm-year observations.

6.3.2. Data analysis

a) The T index

The T index, introduced by Taplin (2004), was employed to measure harmony in carbon financial disclosure. The T index seems to be the most appropriate method as it brings together all of the required properties to quantify comparability of accounts (Cole *et al*., 2009; Mustata *et al*., 2011). Indices technique to compare accounting policy choices by firms was introduced in accounting research by van der Tas (1988). Taplin (2004) developed further this methodology by extending the H, C and I indices proposed by van der Tas (1988), as well as other variants that have emerged in literature since then, to a flexible framework comprising most of the previous indices, either directly or by retaining their desirable properties, and allowing the researcher to form a specific index with the desired characteristics for a particular analysis (refer to section 3.2).

The T index equals the probability that two firms randomly selected, with replacement, have accounts that are comparable, ranging from 0, when all firms have financial statements non-comparable to each other, to 1, when all firms have financial statements that are comparable to each other.

The flexibility in the T index comes from the possibility to specify which accounting methods are comparable, and to give distinct weights for comparisons between firms belonging to two different countries (refer to section 3.2.2). This is achieved by

specifying two coefficients: the coefficient of comparability between accounting method k and accounting method l (α_{kl}), and the coefficient of comparability between firms in countries i and j (β_{ij}). Based on prior literature, Taplin (2004) identified the main criteria to arrive at a specific index within this framework: (1) the weight given to firms or countries; (2) the international focus: within country; between country; or overall; (3) the treatment of multiple accounting policies; (4) the treatment of non-disclosure. The first two criteria determine the coefficients β_{ij} (refer to Table 3-2), and the last two criteria determine the coefficients α_{kl} (refer to Table 3-1).

Although the specification of the T index is designed to address the comparability among countries, this index can also be used to quantify harmony in other units of analysis, as pointed out by Taplin (2006). In particular, comparisons based on countries may not be the most appropriate when firms are multi-listed in several countries. So, in this research, instead of focusing comparisons on a country-by-country basis, the T index is used to measure the harmony among different groups of firms sorted according the relevant criteria to test research questions: type of guidance, industry affiliation, listing status, and level of exposure to international markets.

Along the study five sets of indices are presented, covering the period 2005-2012:

- The first set measures the level of harmony among the firms pertaining to the same group, by using only data for each group, separately.
- The second set measures harmony at EU-15 level (T overall) by treating all firms in the sample as belonging to the same nation irrespective of their country of origin within the EU (Table 3-2 | option 2a: overall international focus) and giving equal weight to each firm in the sample (Table 3-2 | option 1a).
- Finally, when analyzing levels of harmony by industry, another three sets of indices are computed, by assuming the three sorts of international focus allowed in the T index: overall (Table 3-2 | option 2a), within industries (Table 3-2 | option 2b), and between industries (Table 3-2 | option 2c), giving (in all cases) equal weight to each industry in the sample (Table 3-2 | option 1b).

Annex XV shows the correspondent β_{ij} coefficients matrices arising out of all the options under consideration.

Prior literature usually evaluates harmony in disclosure regarding a minimum of comparable information (refer to section 3-2). In the present research, among the items included in the disclosure index (DISC), three topics were selected as the minimum level of information necessary for users to evaluate firms' performance in terms of GHG emissions and to project future cash flows (EFRAG, 2012, § 37):

A. GHG emission allowances granted at no cost, or below market (informing about granted allowances and the gains they represent to the firm).
B. GHG emissions made during the year (informing about the cost of pollution that the firm bears due to its activities).
C. Excess or shortfall of GHG emission allowances at year-end (informing whether EU-ETS targets were accomplished, or not, and how the firm can face its surrendering obligation).

As described in the next table, for each topic four possible treatments are considered:

(i) Not disclosed.
(ii) Disclosed only in physical units (CO2 tones).
(iii) Disclosed only in currency units.
(iv) Disclosed both in physical and in currency units.

To better evaluate comparability of information for users, instead of measuring harmony on an item-by-item basis (i.e. presenting a set of indices for each topic separately), this study considers an aggregate approach summarizing comparability in a single index for all the topics under review. To the best of my knowledge, the present analysis innovates by considering an aggregate approach to measure accounting disclosure harmony.

In order to achieve a single disclosure index, the 4 possible treatments for each one of the 3 headings were aggregated, arriving at a total of 64 possible treatments (disclosure methods), as described in Annex XVI. In this regard, it should be noted that T index is not affected by possible zero frequencies for some of those 64 disclosure methods. On the contrary, results would be impaired if fewer disclosure methods were considered than those actually applied by firms (Taplin, 2006).

Table 6-2: Possible disclosure methods for minimum comparable information

Disclosure items	**Possible treatments on an item-by-item basis**	
	Nº	**Description**
A. GHG emission allowances granted at no cost or below market (2005-2007 | 2008-2012)	4	Not disclosed Disclosed only in physical units (CO2 tones) Disclosed only in currency units Disclosed both in physical and in currency units
B. GHG emissions made during the year	4	Not disclosed Disclosed only in physical units (CO2 tones) Disclosed only in currency units Disclosed both in physical and in currency units
C. Excess or shortfall of GHG emission allowances at year-end	4	Not disclosed Disclosed only in physical units (CO2 tones) Disclosed only in currency units Disclosed both in physical and in currency units
Aggregate approach (A&B&C)	**Possible treatments on an aggregate approach**	
Allowances&Emissions&Position at year-end	64	Disclosure methods

Then, for estimating the coefficients of comparability between disclosure methods, this study explores the flexibility of the T index that comes from allowing fractional comparability between accounting methods (Table 3-1 | option 3c) with α_{kl} assuming a value on the continuum from zero (completely incomparable) to one (completely comparable). So, the option to allocate different levels of comparability to disclosure methods, according to the degree of information provided by each method, is used to assure that harmonization towards a more informative policy gets a higher score. To assign relative levels of comparability proportionate to the information provided by each disclosure method the following procedure was established:

i) identification of the most informative method (*MIM*).
ii) computation of the maximum number of comparable items under *MIM*.
iii) allocation of relative degrees of comparability by reference to this maximum, according to the following expression:

$$\alpha_{Kl,MIM} = \frac{number\ of\ comparable\ items\ between\ disclosure\ methods\ K\ and\ l}{(maximum)\ number\ of\ comparable\ items\ under\ MIM}$$

where:

$\alpha_{kl,MIM}$ is the *relative* coefficient of comparability between disclosure methods *k* and *l*, by reference to the most informative disclosure method *MIM*.

Finally, this study assumes that non-disclosure is comparable to nothing (Table 3-1 | option 4c). In this regard, it should be noted that the sample comprises no "not-applicable" cases, since all firms were covered by EU-ETS over the eight-year period under review. Annex XVII shows the $\alpha_{kl,MIM}$ matrix (64 x 64) describing the comparability between all the 64 disclosure methods under consideration.

b) The T index adjusted to control for industry effects

A firm attribute generally associated with accounting policy choice and disclosure is the sector of operations (Peill, 2000; Jaafar and McLeay, 2007). In line with previous research, the results discussed in section 5.4 afford the assumption that industry is a significant determinant of carbon financial disclosure. Hence, it is reasonable to assume that the assessment of differences in the levels of harmony focused only on "unadjusted" T indices may be misleading when comparing subsamples with dissimilar industry composition.

In empirical research, a common approach to solve this kind of problem consists in selecting paired subsamples in order to form groups of firms with similar characteristics. Unfortunately, in most of empirical studies on accounting harmonization, available data set is not large enough to allow selecting only those observations that will preserve relative weight of industries in every subsample. Furthermore, such a procedure would imply to remove some observations pertaining to over-represented industries and, hence, to neglect the information they convey.

So, an alternative approach was developed in this study to control for industry effects, within the T index framework. The procedure consists on producing adjustments to subsamples simulating for all groups an industry composition similar to that of the control group. This method has the advantage of preserving sample size, as it does not require the arbitrary exclusion of some observations. Instead of removing from the subsamples some of the firms belonging to the over-represented industries, this procedure is able to retain all the observations in every group, because the adjustments are not to be produced in the number of observations but in their relative weight when computing the proportion of firms applying each disclosure method. Detailed explanation of this technic is presented in a methodological note in the Appendix.

In the present research, both the EU-ETS incidence by industry, as well as the relative weight of industries in each subsample to be analyzed, are diversified enough to justify controlling industry effects. So, whenever appropriate, adjustments to subsamples were produced, by simulating for all groups an industry composition similar to that of the control group (H1 to H3 - firms under mandatory guidance | H5a to H6b - foreign-listed firms), in order to compute the corresponding adjusted T indices. To the best of my knowledge, the present analysis innovates by exploring the flexibility of the T index to control for industry effects.

c) Statistical inference

The T index was computed for an eight-year period to quantify the level of harmony from 2005 to 2012. Statistical analysis was performed according to two different procedures: non-parametric and parametric technics.

The first one consists on using non-parametric tests of hypotheses to examine, separately, the differences on the level of harmony between groups, and the changes over time (trend) in each group.

To test differences in the T index between different groups of firms or different industries, the non-parametric Wilcoxon-Mann-Whitney (WMW) test was applied. The hypothesis H0 was formulated as follows: "The T index distribution for Group i is the same as that for Group j". Rejection of H0 would point to a difference in the shapes of the two distributions or to a difference in their centres of location.

To test differences in the T index over time, the Spearman correlation coefficient was performed. Following Murphy (2000), this statistic is used to test for trend between a bivariate sample of (Xi,Yi) pairs, where Xi is the fiscal year and Yi is the T index. Here, the hypothesis H0 states the following: "There is no monotonic association between the year and the level of harmony, as measured by the T index, for the eight-year period, 2005-2012". Rejection of H0 would imply that the level of harmony has changed. An increasing trend would indicate that harmonization occurred. A decreasing trend would indicate that disharmonization occurred. However, it should be noted that Spearman's correlation coefficient is a measure of a *monotonic* relationship between paired data,

and thus a non-significant outcome does not necessarily imply that there is no relationship between the variables, it only denotes that there is no *monotonic* correlation.

The second approach is the parametric alternative and consists on regression analysis. Unlike most of prior studies that assess harmony of accounting practices in a single year or in two different points in time, the present investigation fully covers an eight-year period, what allows conducting regression analysis to test jointly trends on harmonization and differences in the level of harmony between subsamples. Some researchers (e.g., van der Tas, 1992b; Pierce and Weetman, 2002) have applied regression analysis to evaluate harmonization trends. The present study develops further this methodology, by testing together differences over time and between groups of firms, through the following set of least square dummy variable regressions:

$$TIndex_i = \alpha_0 + \sum_i \alpha_{1i}\ D_i + \varepsilon_i \qquad \text{(Model 6-1)}$$

$$TIndex_i = \beta_0 + \sum_i \beta_{1i}\ D_i + \beta_2\ Year + \sum_i \beta_{3i}\ D_i\ Year + \varphi_i \qquad \text{(Model 6-2)}$$

where:

TIndex i represents the level of harmony, measured by the T index, for Group *i*.

Di represents a set of dummy variables that equal 1 for the observations belonging to Group *i*, and 0 otherwise. Since the categories are exhaustive and the binary dummies are mutually exclusive, the model includes n-1 groups of firms.

Year is an ordinal variable, labeled from 0 to 7, representing the effort of harmonization from 2005 to 2012, respectively.

ε_i, φ_i represent the residuals.

The first equation (Model 6-1) takes the degree of harmony, measured by the T index, as the dependent variable, and the independent variables are the groups of firms that emerged from the classification by type of guidance, industry, listing status, and international activity presented in section 6.3.1. For each group, repeated observations over an eight-year period, 2005-2012, were considered.

A set of dummy variables (D*i*), equaling 1 for the observations belonging to Group *i*

and 0 otherwise, allows to achieve estimates for each group. Since the categories are exhaustive and the binary dummies are mutually exclusive, the model includes n-1 groups, omitting the baseline category. Therefore, when considering firms sorted by:

- Type of guidance (No_Guidance, Not_Mandatory Guidance, Mandatory_Guidance), the omitted category is No_Guidance (the baseline group).
- Industry (Utilities, Oil&Gas, Basic Materials, Industrials, Consumer Goods&Services), the omitted category is the utility sector (the baseline group).
- Listing status and level of internationalization through sales (Foreign Listed, FSales&Markets_AbAv, FSales&Markets_BlAv), the omitted category is Foreign Listed (the baseline group).

Accordingly, the estimates for the n-1 groups of firms included in the model are provided, in each case, by reference to the omitted category (the baseline group). So, in Model 6-1, the intercept (α_0) is the coefficient of the dropped dummy, playing a role of a reference point. It represents the average level of harmony, over the period 2005-2012, among firms in the category whose dummy variable is not in the equation. The other coefficients (α_{1i}) represent the average difference in the level of harmony between this baseline category and Group *i*, over the eight-year period.

The t-statistic for coefficients α_{1i} tests the null hypothesis of differences between the baseline category and Group *i* are equal to zero. To examine differences between other possible pairs of groups and test its significance, linear combinations of parameters α_{1i}, and the correspondent t-statistics, are performed.

The second equation (Model 6-2) consists on regression analysis of the T index as a function of time, to allow for trend testing. This equation is intended to evaluate differences in the efforts towards harmonization over the eight-year period 2005-2012, and, consistently with the hypotheses formulated in section 6.2, its specification allows the dummies to have different slopes and intercepts for the different groups of firms. That is to say, it is reasonable to expect that different groups exhibit different levels of harmony in 2005, and show dissimilar evolution along the period under consideration. Accordingly, in Model 6-2:

- The intercept (β_0) represents the average level of harmony among the baseline category, in 2005.
- The coefficients of the dummies (β_{1i}) represent the average difference in the level of harmony between the baseline category and Group i, in 2005.
- The coefficient of variable Year (β_2) represents the slope (trend over 2005-2012) for the baseline category; and
- The coefficients of the interaction terms (β_{3i}) represent the average difference in the slope between the baseline category and Group i, over the 2005-2012 period.

The t-statistics for the parameters of the dummies (β_{1i}), and for the parameters of the interaction term (β_{3i}) test the null hypothesis of no differences between the baseline group and Group *i*, regarding to the level of harmony in 2005, and to the harmonization effort from 2005 to 2012, respectively. Additionally, linear combinations of coefficients β_{1i} and β_{3i} and the correspondent t-statistics are used to examine differences between other possible pairs of groups, and to test its significance.

Detection of heteroscedasticity was performed, and the standard errors and the co-variances of the estimators of the coefficients were therefore corrected. Accordingly, the t-statistics were amended.

The estimation was made by the ordinary least squares (OLS) method using version 12.0 of the software STATA. The coefficient of determination (R-squared) is reported as an indicator of the quality of the adjustment.

For verifying that the residuals are normally distributed, which is another important assumption for inference, the Shapiro-Wilk W test for normal data is applied, and whenever the null hypothesis is rejected for a p-value less than 5%, inference is based only on non-parametric tests that do not require the normality of data.

It is widely recognized that deciding to use parametric procedures in preference to non-parametric technics should be based on considerations of its relative power and efficiency. For any given significance level, the most powerful test is the parametric procedure, if residuals are normally distributed. On the other hand, when there are departures from normality the non-parametric tests can have a power advantage. In the

present study, both methodologies are conducted according to the existing characteristics in the data to be analysed: whenever residuals are normally distributed, statistical inference is based on parametric procedures; otherwise, only the results of the non-parametric technics are considered for hypotheses testing. However, it should be noted that, in the present case, both methodologies lead to similar statistical inference.

6.4. Results and conclusions

Hypotheses H1 to H3 address whether formal guidance enhances the level of harmony in carbon financial disclosure.

To test these hypotheses, firms were grouped according to the type of guidance on accounting for GHG emission allowances they face in their home-country (Spain: mandatory guidance | Austria, Belgium, Finland, France, Germany and Portugal: guidance not mandatory for entities under IFRS | Other EU-15 Member States: no specific guidance). Then, T indices were computed, and Spearman correlation coefficient, WMW tests and regression analysis were performed. Along with the harmony among firms pertaining to each group, this study also evaluates harmony in carbon financial disclosure at EU-15 level (T overall) by treating all firms in the sample as belonging to the same nation irrespective of their country of origin, and giving equal weight to each firm in the sample. Relative frequencies of disclosure methods are reported in Annex XVIII. Findings are summarized in Table 6-3.

With regard to the harmony in carbon financial disclosure at EU-15 level, the probability that two firms randomly selected have accounts that are comparable (T overall) ranges from, 0,0350, in 2005, to 0,0557, in 2012. This improvement in the T index is essentially due to a decrease in cases of non-disclosure (ND), from 63%, in 2005, to 58%, in 2012 (Annex XVIII | DM 64), and an increase in the number of firms disclosing all the items classified as minimum information required for users to compare firms' carbon financial disclosures, from 5%, in 2005, to 8%, in 2012 (Annex XVIII | DM 1). When evaluating this upward movement in the T index, Spearman correlation coefficient test confirms a significant ($p<0,05$) positive trend along the eight years under review (Table 6-3 | Panel A).

Table 6-3: Summary of results by type of guidance

PANEL A: T index by type of guidance, T overall and Spearman correlation results

1344 firm-year observations	2005	2006	2007	2008	2009	2010	2011	2012	ρ
Mandatory_Guidance	0,3805	0,5723	0,5630	0,5923	0,6023	0,6023	0,6023	0,6023	0,9132 ***
Not_Mandatory _Guid	0,0344	0,0617	0,0593	0,0558	0,0555	0,0569	0,0569	0,0569	0,0732
No_Guidance	0,0044	0,0047	0,0047	0,0058	0,0080	0,0070	0,0070	0,0070	0,8051 **
International focus									
Overall	0,0350	0,0544	0,0528	0,0532	0,0563	0,0557	0,0557	0,0557	0,7563 **

Significant at: *** 1% | ** 5% | * 10%.

PANEL B: Wilcoxon-Mann-Whitney to test differences in the T index by type of guidance

	Not_Mandatory_Guid	No_Guidance
Mandatory_Guidance	3,396 ***	3,396 ***
Not_Mandatory _Guid		3,381 ***

*** Significant at 1%.

PANEL C: Estimation results for Model 6-1 (Baseline category: No_Guidance)

Number of obs = 24		Dependent variable - T Index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
Mandatory_Guid	D1	0,5586	20,79 ***		
Not_Mandatory_Guid	D2	0,0486	16,09 ***		
Intercept (No_Guidance)		0,0061	12,80 ***		
				0,97	344,71 ***

D1 is a dummy variable that equals 1 for Mandatoty_Guidance, and 0 otherwise.
D2 is a dummy variable that equals 1 for Not_Mandatoty_Guidance, and 0 otherwise.
Heteroskedasticity-robust t-statistics are reported. *** Significant at 1%.
Model 6-1: $T\ Index_i = \alpha_0 + \Sigma\ \alpha_{1i}\ Di + \varepsilon_i$

Hypothesis H0	Coef.	t-statistic
$\alpha_{11} - \alpha_{12} = 0$	0,5100	18,87 ***

*** Reject H0 for a significance level of 1%.

Over the research period, firms under mandatory guidance show the lowest rates of ND, dampening from 14%, in 2005, to 5%, in 2012 (Annex XVIII | DM 64). With regard to firms domiciled in countries where local guidance is not required for entities under IFRS, frequency of ND ranges from 58%, in 2005, to 50%, in 2012 (Annex XVIII | DM 64). Among the group of firms with registered address in countries where no guidance was delivered, ND reached the highest occurrences equaling around 82% along the eight-year period (Annex XVIII | DM 64). On the other hand, with regard to the most informative disclosure method (DM 1), the highest incidence is observed among firms under mandatory guidance, growing from 27%, in 2005, to 45%, in 2012 (Annex XVIII | DM 1). In the opposite pole lies the group of firms with no guidance in home-country, where zero cases of full disclosure were observed in 2012 (Annex XVIII | DM 1).

Computation of T index indicates that, in 2005, the probability that two Spanish firms (under mandatory guidance) randomly selected have accounts that are comparable (T index) equaled 0,3805 (Table 6-3 | Panel A). Over the period under review, harmony has increased among this group of firms reaching a score of 0,6023, in 2012, being that the highest growth was observed in 2006. This evolution seems to be consistent with the issuance of the Resolution ICAC (2006) in 8 February 2006, entering into force on the day following that of publication in the Official State Bulletin. As the standard was issued in early 2006, some firms may have it applied to 2005 accounts. So, already in this first year the level of harmony among Spanish firms was considerably higher than in any other subsample (Table 6-3 | Panel B). Full effects of the standard came in 2006 leading to an increase in the T index to 0,5723 in that year. In fact, from there on, more than 40% of the Spanish firms have applied the most informative disclosure method (DM 1), and no cases of non-disclosure (DM 64) were registered, which explains a T index of 0,6023, in 2012. Accordingly, computation of Spearman correlation coefficient test indicates a significant ($p<0,01$) growth trend in the harmony of carbon financial disclosure, from 2005 to 2012 (Table 6-3 | Panel A).

Considering the firms belonging to countries where national guidance was provided, though not mandatory for entities under IFRS, the probability that two randomly selected firms have accounts that are comparable went from 0,0344, in 2005, to 0,0569, in 2012 (Table 6-3 | Panel A). However, this upward movement was not consistent (monotonic) all over the period, being that Spearman correlation coefficient does not recognize a significant growth trend among this group (Table 6-3 | Panel A). Regarding the firms under no guidance, despite the positive trend on harmony among them (Table 6-3 | Panel A), the levels of harmony remained the weakest of all subsamples, moving from 0,0044, in 2005, to 0,0070, in 2012 (Table 6-3 | Panel A).

Comparisons between subsamples (Mand_Guid | Not_Mand_Guid | No_Guid) indicate that, over the eight-year period (2005-2012), levels of harmony among firms under mandatory guidance are higher than levels of harmony among any other scenario under consideration, and that these differences are statistically significant at a level of 1% (Table 6-3 | Panel B | Panel C). Actually, both the non-parametric WMW tests (3,396, $p<0,001$), and the parametric tests coming from Model 6-1 (0,5586, $p<0,001$ | 0,5100,

p<0,001) indicate that, under mandatory guidance the level of harmony in carbon financial disclosure, over the eight-year period, is significantly higher than in any other scenario under review.

Considering the differences in industry composition among subsamples, adjusted T indices were computed, by simulating for the two subsamples that were disclosing in a voluntary basis (Not_Mand_Guid | No_Guid) an industry composition similar to that of the group of firms under mandatory guidance. Adjusted relative frequencies are reported in Annex XIX. After controlling for industry effects, main outcomes remained unchanged, as reported in Table 6-4. That is, over the research period, levels of harmony among firms under mandatory guidance are, on average, significantly higher than among other sample firms (p<0,001).

Table 6-4: Summary of results by type of guidance, after control for industry effects

PANEL A: Adjusted T index by type of guidance and Spearman correlation results

1344 firm-year observations	2005	2006	2007	2008	2009	2010	2011	2012	ρ
Mandatory_Guidance	0,3805	0,5723	0,5630	0,5923	0,6023	0,6023	0,6023	0,6023	0,9132 ***
Not_Mandatory _Guid_adj	0,0424	0,0707	0,0685	0,0646	0,0646	0,0656	0,0656	0,0656	0,0732
No_Guidance_adj	0,0087	0,0104	0,0094	0,0106	0,0141	0,0129	0,0129	0,0129	0,8051 **

Significant at: *** 1% | ** 5% | * 10%.

PANEL B: Wilcoxon-Mann-Whitney to test differences in the adjusted T index by type of guidance

	Not_Mand_Guid_adj	No_Guidance_adj
Mandatory_Guidance	3,396 ***	3,396 ***
Not_Mand _Guid_adj		3,381 ***

*** Significant at 1%.

PANEL C: Estimation results for Model 6-1 (Baseline category: No_Guidance_adjusted)

Number of obs = 24		Dependent variable - Adjusted T Index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
Mandatory_Guid	D1	0,5532	20,59 ***		
Not_Mandatory_Guid_adj	D2	0,0520	16,40 ***		
Intercept (No_Guidance_adj)		0,0115	16,61 ***		
				0,97	344,57 ***

D1 is a dummy variable that equals 1 for Mandatoty_Guidance, and 0 otherwise.
D2 is a dummy variable that equals 1 for Not_Mandatoty_Guidance_adjusted, and 0 otherwise.
Heteroskedasticity-robust t-statistics are reported. *** Significant at 1%.
Model 6-1: $\text{Adj T Index}_i = \alpha_0 + \Sigma\ \alpha_{1i}\ Di + \varepsilon_i$

Hypothesis H0	Coef.	t-statistic
$\alpha_{11} - \alpha_{12} = 0$	0,5012	18,54 ***

*** Reject H0 for a significance level of 1%.

Largely, findings allow the non-rejection of the hypothesis H1 stating that mandatory guidance is associated with higher levels of harmony in carbon financial disclosure. Consistent with institutional theory, results corroborate that, as the consequences of non-compliance are perceived as more severe than under no mandatory regime, mandatory guidance makes organizations more likely to acquiesce to their requests for information, leading to higher levels of harmony in carbon financial disclosure, than any other scenario under review.

Hypothesis H2 addresses whether formal guidance, though not mandatory for entities under IFRS, promotes the harmony in carbon financial disclosure.

Comparisons between subsamples disclosing in a voluntary basis (Not_Mand_Guid | No_Guid) indicate that, over the eight-year period (2005-2012), levels of harmony in carbon financial disclosure among firms with not mandatory guidance in home-country (Not_Mandat_Guid) are higher than those arising from the group of firms domiciled in countries where no guidance was provided (No_Guid), and those differences are significant at 1% level (Table 6-3 | Panel B | Panel C).

Computation of T index indicates that, in 2005, the probability that two firms with not mandatory guidance in home-country have accounts that are comparable (T index) equaled 0,0344 (Table 6-3 | Panel A). It should be noted that, despite the degree of harmony be low within this group of firms, it is significantly higher than the level of 0,0044 observed, in the same year, among firms with no guidance on accounting for GHG emission allowances, (Table 6-3 | Panel A).

Over the period under review, harmony has increased among firms with not mandatory guidance in home-country reaching a score of 0,0569, in 2012 (Table 6-3 | Panel A). The highest growth was observed in 2006, when the T index arrives at a maximum of 0,0617. This evolution seems to be consistent with the issuance of not mandatory guidance in most countries only in late 2005. So, full effects of formal guidance take place in 2006 leading to an increase in the T index in that year. In fact, from there on, a slight fall in the T index occurred which explains why, over the eight-year period, the Spearman correlation coefficient, although positive, is not statistically significant for this group of firms (Table 6-3 | Panel A).

Notwithstanding, either WMW tests (Table 6-3 | Panel B) or estimation results for coefficient of variable D2 in Model 6-1 (Table 6-3 | Panel C) indicates that, on average, from 2005 to 2012, harmony among firms under not mandatory guidance in home-country is expected to be higher than among firms under no guidance, and difference is statistically significant at 1% level. Additionally, when evaluating the adjusted T indices results remained unchanged (Table 6-4). Therefore, findings allow the non-rejection of the hypothesis H2 stating that formal guidance, although not required for entities under IFRS, is associated with higher levels of harmony in carbon financial disclosure, when compared with the scenario of no specific guidance on how to report GHG emission allowances in the annual accounts.

This is a departure from Rahman *et al.*'s (2002) prediction that higher levels of voluntary disclosure are generally associated with lower comparability of firms' accounts. Contrarily, evidence from this study indicates that when increased disclosure is induced by formal guidance, even not mandatory, higher (not lower) levels of harmony in disclosure are likely to occur. In the lens of institutional theory, when an organization anticipates that conformity with social expectations (even though set out by not mandatory rules) will enhance social fitness, a process of voluntary diffusion, through imitation, is more likely to take place, than under no guidance. Accordingly, as anticipated, results show significantly higher levels of harmony (along with higher levels of disclosure) among firms domiciled in countries where national guidance was issued, though not mandatory for entities under IFRS, than among firms in countries where no guidance on accounting for GHG emission allowances was provided.

Hypothesis 3 addresses whether not mandatory detailed guidance is more likely to enhance harmony in carbon financial disclosure, than not mandatory guidance that does not specify detailed demands for disclosure. Findings are summarized in Table 6-5, where firms with some guidance in home-country, though not mandatory for entities under IFRS, are classified into two subgroups according to the detail on items to be reported in annual accounts that were set out by national guidance (Not_Mandatory Detailed Guidance | Not_Mandatory Not_Detailed Guidance). Relative frequencies of disclosure methods are reported in Annex XX.

Comparisons between subsamples under no mandatory regime (No_Guid | Not_Mandat

Detailed_Guid | Not_Mand Not_Detailed_Guid) indicate that, over the period 2005-2012, levels of harmony among firms with detailed guidance in home-country (Not_Mandat Detailed_Guid) are higher than those arising from any other group of firms disclosing in a voluntary basis (Not_Mandat Not_Detailed_Guid | No_Guidance), and those differences are significant at 1% level (Table 6-5 | Panel B | Panel C).

Table 6-5: Summary of results by detail of guidance on disclosure items

PANEL A: T index by detail on disclosure items and Spearman correlation results

1168 firm-year observations	2005	2006	2007	2008	2009	2010	2011	2012	ρ
Not_Mandatory _Guidance	0,0344	0,0617	0,0593	0,0558	0,0555	0,0569	0,0569	0,0569	0,0732
of which:									
Detailed_Guidance	0,0866	0,2272	0,2148	0,2064	0,2064	0,2064	0,2064	0,2064	- 0,1091
Not_Detailed_Guidance	0,0245	0,0342	0,0331	0,0311	0,0306	0,0320	0,0320	0,0320	0,0732
No_Guidance	0,0044	0,0047	0,0047	0,0058	0,0080	0,0070	0,0070	0,0070	0,8051 **

Significant at: *** 1% | ** 5% | * 10%.

PANEL B: Wilcoxon-Mann-Whitney to test differences in the T index by detail on disclosure items

	Not_Mandat_Not_Detailed_Guid	No_Guidance
Not_Mandat_Detailed_Guid	3,422 ***	3,422 ***
Not_Mandat_Not_Detailed_Guid		3,381 ***

*** Significant at 1%.

PANEL C: Estimation results for Model 6-1 (Baseline category: No_Guidance)

Number of obs = 24		Dependent variable - T Index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
Not_Mandatory_Detailed_Guid	D2a	0,1890	12,02 ***		
Not_Mandatory_Not_Detailed_Guid	D2b	0,0251	22,08 ***		
Intercept (No_Guidance)		0,0061	12,80 ***		
				0,92	312,66 ***

D2a is a dummy variable that equals 1 for Not_Mandatoty_Detailed_Guidance, and 0 otherwise.
D2b is a dummy variable that equals 1 for Not_Mandatoty_Not_Detailed_Guidance, and 0 otherwise.
Heteroskedasticity-robust t-statistics are reported. *** Significant at 1%.
Model 6-1: $T\ Index_i = \alpha_0 + \Sigma\ \alpha_{1i}\ Di + \varepsilon_i$

Hypothesis H0	Coef.	t-statistic
$\alpha_{12a} - \alpha_{12b} = 0$	0,1639	10,41 ***

*** Reject H0 for a significance level of 1%.

In 2005, the probability that two randomly selected firms with detailed guidance in home-country, though not mandatory, have accounts that are comparable (T index) equaled 0,0866 (Table 6-5 | Panel A). Throughout the period under review, harmony has increased among this group of firms reaching a score of 0,2064, in 2012 (Table 6-4 | Panel A). The highest growth was observed in 2006, when the T index arrives at a

maximum of 0,2272. Over the period under consideration, either WMW tests (Table 6-5 | Panel B) or estimation results coming from Model 6-1 (Table 6-5 | Panel C) indicate that harmony among the group of firms with detailed guidance in home-country (Not_Mandat_Detailed_Guid) is significantly higher ($p<0,001$), than the one observed among firms domiciled in countries where guidance does not specify detailed demands on disclosure items.

Largely, findings allow the non-rejection of the hypothesis H3 stating that the level of harmony in carbon financial disclosure is predicted to be higher among firms domiciled in countries where national guidance, though not mandatory for entities under IFRS, comprises detailed demands for disclosure, than among firms domiciled in countries where not mandatory guidance does not specify detailed demands on the items to be reported in the annual accounts. In line with institutional theory and stakeholder theory, accounting guidance outlining detailed benchmarks for disclosure, though not mandatory, helps to inform the public opinion on disclosure best practices, and contributes to raise stakeholders' perception that lack of critical information may well correspond to bad news. As a consequence, firms (not wanting to incur the costs of bad reputation) tend to follow non-mandatory benchmarks to respond to a major search of information by stakeholders. So, as anticipated, results allow admitting that not mandatory detailed guidance is significantly associated with higher levels of harmony in carbon financial disclosure (along with higher levels of disclosure), when compared with not mandatory guidance that does not specify detailed demands for disclosure.

Then, to investigate whether, under no mandatory guidance on accounting for GHG emission allowances, higher levels of harmony are likely to occur in carbon intensive and regulated industries (H4), the T index was computed by industrial sectors, being that, beside the level of harmony among firms pertaining to the same industry (obtained from data for each industry separately), T index within industries (Table 3-2 | option 1b, 2b), T index between industries (Table 3-2 | option 1b, 2c), and T overall (Table 3-2 | option 1b, 2a) were also computed, giving equal weight to each industry in the sample. Afterwards, Spearman correlation coefficient, WMW tests and regression analysis were performed. Relative frequencies of disclosure methods are reported in Annex XXI. Findings are summarized in Table 6-6.

Table 6-6: Summary of results by industry

PANEL A: T index by industry, T Within, T Between, T Overall and Spearman correlation results

1168 firm-year observations	2005	2006	2007	2008	2009	2010	2011	2012	ρ
Utilities	0,0535	0,1019	0,0926	0,0756	0,1044	0,0926	0,0926	0,0926	0,2283
Oil&Gas	0,0485	0,0544	0,0519	0,0850	0,0961	0,0961	0,0961	0,0961	0,9132 ***
Basic Materials	0,0246	0,0450	0,0406	0,0444	0,0476	0,0476	0,0476	0,0476	0,8625 ***
Industrials	0,0237	0,0247	0,0277	0,0197	0,0179	0,0179	0,0179	0,0179	- 0,8371 ***
Consumer Goods&Services	0,0003	0,0023	0,0016	0,0029	0,0029	0,0029	0,0029	0,0029	0,8456 ***
Other industries	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	
Within	0,0200	0,0292	0,0284	0,0269	0,0296	0,0287	0,0287	0,0287	0,7563 **
Between	0,0024	0,0039	0,0037	0,0038	0,0042	0,0042	0,0042	0,0042	0,7563 **
Overall	0,0154	0,0247	0,0237	0,0232	0,0253	0,0248	0,0248	0,0248	0,7563 **

Significant at: *** 1% | ** 5% | * 10%.

PANEL B: Wilcoxon-Mann-Whitney to test differences in the T index by industry

	Oil&Gas	Basic Materials	Industrials	Consumer Goods&Services	Other industries
Utilities	0,533	3,411 ***	3,398 ***	3,424 ***	3,620 ***
Oil&Gas		3,411 ***	3,411 ***	3,437 ***	3,620 ***
Basic Materials			3,198 ***	3,437 ***	3,620 ***
Industrials				3,437 ***	3,620 ***
Consumer Goods&Services					2,565 **

International focus	T Between
T Within	3,275 ***

Significant at: *** 1% | ** 5% | * 10%.

PANEL C: Estimation results for Model 6-1 (Baseline category: Utilities)

Number of obs = 40		Dependent variable - T index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
Oil&Gas	D4	- 0,0102	- 1,04		
Basic Materials	D5	- 0,0451	- 7,00 ***		
Industrials	D6	- 0,0673	- 11,28 ***		
Consumer Goods&Services	D7	- 0,0859	- 14,77 ***		
Intercept (Utilities)		0,0882	15,19 ***		
				0,88	167,99 ***

D4 is a dummy variable that equals 1 for observations belonging to Oil&Gas, and 0 otherwise.
D5 is a dummy variable that equals 1 for observations belonging to Basic Materials, and 0 otherwise.
D6 is a dummy variable that equals 1 for observations belonging to Industrials, and 0 otherwise.
D7 is a dummy variable that equals 1 for observations belonging to Consumer Goods&Services, and 0 otherwise.
Heteroskedasticity-robust t-statistics are reported. Significant at: *** 1% | ** 5% | * 10%.
Model 6-1: $T\ Index_i = \alpha_0 + \Sigma\ \alpha_{1i}\ Di + \varepsilon_i$

In general, from 2005 to 2012, the average levels of harmony among utility firms are higher than those observed among firms in any other industry, and differences are statistically significant to a level of significance of 1%. The only exception is the comparison between Utilities and Oil & Gas, where Oil & Gas shows a lower level of harmony, but differences between these two industries (the most carbon intensive in the

whole sample) are not statistically significant (Table 6-6 | Panel B | Panel C). In addition, to test the existence of an intra-industry "disciplinarian effect" coming from sector-level regulations, comparison of T index within and between industries was performed. Consistent with Peill (2000), Jaafar and McLeay (2007), and Jackson and Apostolakou (2010), higher levels of harmony are likely to occur within industries, than between in industries, and differences are significant at 1% level (Table 6-6 | Panel B).

In summary, findings allow not reject the hypothesis H4 stating that higher levels of harmony are likely to occur among more carbon intensive and regulated industries. On one hand, these results have important implications for future research, by confirming that comparisons between subsamples with different industry composition must be validated through the assessment of the adjusted T index, in order to control for industry effects. On the other hand, they are consistent with institutional theory and stakeholder theory, admitting that high carbon intensive firms have created routines to collect and treat information, and will tend to adopt more organized and explicit carbon financial disclosure policies, either as a result of their own reaction to public pressure or because they are compelled to do so by sector-level regulations. Overall, evidence suggests that firms operating in the same industry face common legitimization challenges, are affected by similar regulations, and tend to imitate competitors' behavior either at national or international level, implying that harmony is more likely to occur within industries, than between industries.

Next, to test the existence of a "disciplinarian effect" of capital markets over harmony in carbon financial disclosure, hypotheses H5a and H5b examine whether, in the context of no mandatory guidance on accounting for GHG emission allowances, levels of harmony among foreign listed firms are higher than among firms registered only in domestic stock exchanges, and whether those levels increase over time as foreign listed firms converge to best disclosure practices. Relative frequencies of disclosure methods are reported in Annex XXII. Findings are summarized in Table 6-7.

Findings indicate that, from 2005 to 2012, more than 80% of the foreign listed firms did not disclose any of the items classified as the minimum information required for users to compare firms' carbon financial disclosures (Annex XXII | DM 64). Accordingly, over the period under review, the probability that two randomly selected foreign listed

firms have accounts that are comparable is equal or minor than 0,0118 (Table 6-7 | Panel A). This score corresponds to the lowest level of harmony observed in all and each of the sample groups, and either WMW tests (Table 6-7 | Panel B) or regression estimates (Table 6-7 | Panel C) suggest that the differences between foreign listed firms and any other sample group are statistically significant at 1% level.

Also, regression estimates show that, in 2005, the lowest level of harmony was observed among foreign listed firms, and coefficients of variables D9 and D10, in Model 6-2, indicate that the difference between this group and other firms disclosing on a voluntary basis were statistically significant in this first year (Table 6-7 | Panel D).

Furthermore, from there on, no progresses on the level of harmony were observed among foreign listed firms. On the contrary, harmony significantly decreased among this group, over the period under consideration, as indicated by Spearman correlation coefficient (Table 6-7 | Panel A), and coefficient of variable *Year* in Model 6-2 (Table 6-7 | Panel D). Accordingly, either WMW tests (Table 6-7 | Panel B) or coefficients of variables D 9 and D10 coming from Model 6-1 (Table 6-7 | Panel C) indicate that, on average, levels of harmony among foreign listed firms show the poorest performance along the research period ($p<0,001$).

In summary, results do not allow confirming the existence of a "disciplinarian effect" of capital markets (H5a, H5b) over harmony in carbon financial disclosure. Conversely, foreign listed firms display the poorest level of harmony of all, in 2005, and show no signs of progress towards harmonization from 2005 to 2012.

Finally, to test the existence of a "disciplinarian effect" over harmony in carbon financial disclosure coming from the external markets of products and services to which the firm is exposed, hypotheses H6a and H6b examine if, considering entities listed only in domestic stock exchanges and disclosing under no mandatory regime (on accounting for GHG emission allowances), levels of harmony among firms with greater exposure to foreign markets are higher than those observed among firms operating mainly in domestic markets, and if those levels of harmony increase over time as firms operating internationally converge to best disclosure practices. Relative frequencies of disclosure methods are reported in Annex XXII. Findings are summarized in Table 6-7.

Table 6-7: Summary of results by listing status and internationalization through sales

PANEL A: T index by listing status and foreign sales, T overall, and Spearman correlation results

1168 firm-year observations	2005	2006	2007	2008	2009	2010	2011	2012	ρ
Foreign-Listed	0,0118	0,0076	0,0081	0,0027	0,0027	0,0027	0,0027	0,0027	- 0,8456 ***
FSales&Markets_AbAv	0,0167	0,0270	0,0290	0,0256	0,0245	0,0245	0,0245	0,0245	- 0,2029
FSales&Markets_BlAv	0,0172	0,0345	0,0305	0,0380	0,0464	0,0449	0,0449	0,0449	0,8051 **
Overall	0,0154	0,0247	0,0237	0,0232	0,0253	0,0248	0,0248	0,0248	0,7563 **

Significant at: *** 1% | ** 5% | * 10%.

PANEL B: Wilcoxon-Mann-Whitney to test differences in the T index by listing status and foreign sales

	FSales&Markets_AbAv	FSales&Markets_BlAv
Foreign-Listed	- 3,437 ***	- 3,422 ***
FSales&Markets_AbAv		- 2,653 **

Significant at: *** 1% | ** 5% | * 10%.

PANEL C: Estimation results for Model 6-1 (Baseline category: Foreign-Listed)

Number of obs = 24		Dependent variable - T index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
FSales&Markets_AbAv	D9	0,0194	10,86 ***		
FSales&Markets_BlAv	D10	0,0325	8,58 ***		
Intercept (Foreign-Listed)		0,0051	4,07 ***		
				0,83	78,13 ***

D9 is a dummy variable that equals 1 for observations belonging to FSales&Markets_AbAv, and 0 otherwise.
D10 is a dummy variable that equals 1 for observations belonging to FSales&Markets_BlAv, and 0 otherwise.
Heteroskedasticity-robust t-statistics are reported. *** Significant at 1%.
Model 6-1: $T\ Index_i = \alpha_0 + \Sigma\ \alpha_{1i}\ Di + \varepsilon_i$

Hypothesis H0	Coef.	t-statistic
$\alpha_{1\ 9} - \alpha_{1\ 10} = 0$	- 0,0131	- 3,46 ***

** Reject H0 for a significance level of 5%.

PANEL D: Estimation results for Model 6-2 (Baseline category: Foreign-Listed)

Number of obs = 24		Dependent variable - T index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
FSales&Markets_AbAv	D9	0,0137	3,44 ***		
FSales&Markets_BlAv	D10	0,0129	2,76 **		
FSales&Markets_AbAv x Year	D9 x Y	0,0016	2,06 *		
FSales&Markets_BlAv x Year	D10 x Y	0,0063	5,56 ***		
Year (Foreign_Listed)	Y	- 0,0013	- 4,26 ***		
Intercept (Foreign-Listed)		0,0096	7,22 ***		
				0,96	196,08 ***

D9 is a dummy variable that equals 1 for observations belonging to FSales&Markets_AbAv, and 0 otherwise.
D10 is a dummy variable that equals 1 for observations belonging to FSales&Markets_BlAv, and 0 otherwise.
Year (Y) is an ordinal variable labeled from 0 to 5 representing the effort of harmonization from 2005 to 2010.
Heteroskedasticity-robust t-statistics are reported. Significant at: *** 1% | ** 5% | * 10%.
Model 6-2: $T\ Index_i = \beta_0 + \Sigma\ \beta_{1i}\ Di + \beta_2\ Year + \Sigma\ \beta_{3i}\ Di\ Year + \varphi_i$

Hypotheses H0	Coef.	t-statistic
$\beta_{1\ 9} - \beta_{1\ 10} = 0$	0,0009	0,15
$\beta_{3\ 9} - \beta_{3\ 10} = 0$	- 0,0047	- 3,72 ***

Reject H0 for a significance level of: *** 1% | ** 5% | * 10%.

When evaluating the differences in the T index between the two subsamples (FS&Markets_AbAv | FS&Markets_BlAv) either WMW tests (Table 6-7 | Panel B), or regression estimates (Table 6-7 | Panel C) suggest that there is a statistically significant difference between firms acting internationally and those operating mainly in domestic markets. However, contrary to prediction (H6a), levels of harmony observed among firms acting internationally are, on average, lower than those registered among firms with less exposure to foreign markets.

Among the group comprising firms with higher exposure to foreign markets (FSales&Markets_AbAv), regression estimates (Table 6-7 | Panel D) show that, in 2005, the level of harmony was higher than among firms with smaller international activity (FSales&Markets_BlAv), but linear combination of parameters D9 and D10 coming from Model 6-2, indicate that differences between these two groups are not statistically significant in this first year. Moreover, from there on, progresses in the level of harmony were sharper among firms more dedicated to domestic markets, as indicated by Spearman correlation coefficient (Table 6-7 | Panel A), and linear combination of parameters D9 x Y and D10 x Y coming from Model 6-2 (Table 6-7 | Panel D). Accordingly, along the eight-year period, levels of harmony in carbon financial disclosure show a poorer performance among firms with higher international exposure through sales, than among firms with lower international activity.

So, evidence does not allow confirming a "disciplinarian effect" over harmony in carbon financial disclosure coming from the foreign markets in which the firm operates. In particular, unlike formulated in hypotheses H6a and H6b, from 2005 to 2012, firms operating mainly in domestic markets seem to reach higher levels of harmony and more progress towards harmonization than firms with higher exposure to foreign markets.

Additionally, considering differences in industry composition among the groups (Foreign-Listed, FSales&Markets_AbAv, FSales&Markets_BlAv), adjusted T indices were computed, by simulating for the two subsamples listed only in domestic stock exchanges an industry composition similar to that of the group comprising foreign listed firms. Adjusted relative frequencies of disclosure methods are reported in Annex XXIII. Findings are summarized in Table 6-8.

Table 6-8: Summary of results by listing status and internationalization through sales, after control for industry effects

PANEL A: Adjusted T index by listing status and foreign sales, and Spearman correlation results

1168 firm-year observations	2005	2006	2007	2008	2009	2010	2011	2012	ρ
Foreign-Listed	0,0118	0,0076	0,0081	0,0027	0,0027	0,0027	0,0027	0,0027	-0,8456 ***
FSales&Markets_AbAv_adj	0,0162	0,0263	0,0278	0,0235	0,0228	0,0228	0,0228	0,0228	- 0,2029
FSales&Markets_BlAv_adj	0,0089	0,0173	0,0150	0,0207	0,0252	0,0239	0,0239	0,0239	0,8051 **

Significant at: *** 1% | ** 5% | * 10%.

PANEL B: Wilcoxon-Mann-Whitney to test differences in the adjusted T index by listing status and foreign sales

	FSales&Markets_AbAv_adj	FSales&Markets_BlAv_adj
Foreign-Listed	- 3,437 ***	3,315 ***
FSales&Markets_AbAv_adj		- 0,637

Significant at: *** 1% | ** 5% | * 10%.

PANEL C: Estimation results for Model 6-1 (Baseline category: Foreign-Listed)

Number of obs = 24		Dependent variable - Adjusted T index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
FSales&Markets_AbAv_adj	D9	0,0180	9,67 ***		
FSales&Markets_BlAv_adj	D10	0,0150	6,76 ***		
Intercept (Foreign-Listed)		0,0051	4,07 ***		
				0,78	52,08 ***

D9 is a dummy variable that equals 1 for observations belonging to FSales&Markets_AbAv_adj, and 0 otherwise.
D10 is a dummy variable that equals 1 for observations belonging to FSales&Markets_BlAv_adj, and 0 otherwise.
Heteroskedasticity-robust t-statistics are reported. *** Significant at 1%.
Model 6-1: $T\ Index_i = \alpha_0 + \Sigma\ \alpha_{1i}\ Di + \varepsilon_i$

Hypothesis H0	Coef.	t-statistic
$\alpha_{1\ 9} - \alpha_{1\ 10} = 0$	0,0030	1,32

Reject H0 for a significance level of: *** 1% | ** 5% | * 10%.

PANEL D: Estimation results for Model 6-2 (Baseline category: Foreign-Listed)

Number of obs = 18		Dependent variable - Adjusted T index			
Independent variables		Coef.	t-statistic	R^2	F-statistic
FSales&Markets_AbAv_adj	D9	0,0130	3,29 ***		
FSales&Markets_BlAv_adj	D10	0,0033	1,21		
FSales&Markets_AbAv_adj x Year	D9 x Y	0,0015	1,82 *		
FSales&Markets_BlAv_adj x Year	D10 x Y	0,0033	5,54 ***		
Year (Foreign_Listed)	Y	- 0,0012	- 4,08 ***		
Intercept (Foreign-Listed)		0,0095	6,85 ***		
				0,91	86,65 ***

D9 is a dummy variable that equals 1 for observations belonging to FSales&Markets_AbAv_adj, and 0 otherwise.
D10 is a dummy variable that equals 1 for observations belonging to FSales&Markets_BlAv_adj, and 0 otherwise.
Year (Y) is an ordinal variable labeled from 0 to 5 representing the effort of harmonization from 2005 to 2010.
Heteroskedasticity-robust t-statistics are reported. Significant at: *** 1% | ** 5% | * 10%.
Model 6-2: Adjusted $T\ Index_i = \beta_0 + \Sigma\ \beta_{1i}\ Di + \beta_2\ Year + \Sigma\ \beta_{3i}\ Di\ Year + \varphi_i$

Hypothesis H0	Coef.	t-statistic
$\beta_{1\ 9} - \beta_{1\ 10} = 0$	0,0097	2,23 **
$\beta_{3\ 9} - \beta_{3\ 10} = 0$	- 0,0018	- 1,99 *

Reject H0 for a significance level of: ** 5% | * 10%.

Among foreign listed firms, the score of the adjusted T index remains the lowest all subsamples, and either WMW tests (Table 6-8 | Panel B) or regression estimates (Table 6-8 | Panel C) suggest that the differences between foreign listed firms and any other sample group are statistically ($p<0,001$) significant.

With regard to firms listed only in domestic stock markets, linear combination of parameters D9 and D10 coming from Model 6-2 (Table 6-8 | Panel D), point out a significant (0,0097 | $p<0,05$) difference in the adjusted T index in favor of firms operating internationally, in 2005. However, from there on, progress on the level of harmony was sharper among firms with less exposure to foreign markets, as indicated by linear combination of parameters D9 x Y and D10 x Y (- 0,0018 | $p< 0,10$). As a result, over the eight-year period, differences between firms acting internationally and those with lower exposure to foreign markets, after adjusting for industry effects, are not statistically significant as indicated by either WMW tests (Table 6-8 | Panel B), or linear combination of parameters D9 and D10 coming from Model 6-1 (Table 6-8 | Panel B).

In line with results from previous chapter, for EU-15 firms (domiciled in countries that signed the Kyoto Protocol), the internationalization through the quotation in US stock exchanges (a country that has not ratified the Protocol) does not seem to exert further pressure (in addition to the existing in firms' home-country) to converge to similar disclosure practices on GHG emission allowances. In the lens of stakeholder theory and institutional theory, results indicate that, as foreign listed firms realize that this particular information is not broadly valued by their foreign stakeholders, to be accountable to a wider stakeholder audience is not a determinant factor significant enough to motivate, by itself, higher levels of harmony in carbon financial disclosure.

As regards the internationalization through sales, due to multiplicity and fragmentation of foreign constituents, international pressures to disclose costs of carbon are not perceived by EU-15 firms as more convincing than domestic constraints. Consequently, firms' disclosure strategies are primarily driven by domestic guidance. As discussed in previous chapter, consistent with stakeholder theory and institutional theory, when there is no specific guidance in the firm's home-country or when existing guidance does not specify disclosure items, firms' skepticism about the strategic utility of carbon financial

disclosure as a tool to manage a multiplicity of foreign stakeholders inhibits the improvement of disclosure. On the other hand, when there is not mandatory detailed guidance in the firm's home-country, an improvement of disclosure among EU-15 firms with higher level of exposure through foreign sales is likely to occur, but only by means of more qualitative items. So, as regards the harmony in carbon financial disclosure concerning the quantitative items under review (classified as the minimum information required for users to compare firms' carbon financial disclosures) results indicate that, under no mandatory regime, differences between firms with higher exposure to foreign markets and those with lower exposure to foreign markets, are not statistically significant.

Largely, evidence does not allow confirming the existence of a "disciplinarian effect" over harmony in carbon financial disclosure coming from either capital markets or the markets of products and services where foreign customers are located.

Final synthesis

Next table summarizes main results on the effects of formal guidance and exposure to foreign markets, over the harmony in carbon financial disclosure among EU-15 listed firms.

Table 6-9: Summary of results on the "disciplinarian effect" of standards and markets over the harmony in carbon financial disclosure

Explanatory Variables | Hypotheses	**Predicted sign**	**Statistical inference on the association with the T index**
Guidance | H1 H2 H3	+	√√
Industry | H4a H4b	+	√√
Internationalization		
Foreign listing | H5a H5b	+	Not proven
International activity | H6a H6b	+	Not proven

√√ Statistical inference confirms association and predicted sign ($p<0,01$).

7. Summary and conclusions

This chapter provides a summary of the main research findings and their implications, major contributions and limitations of the study, and suggestions for future research.

In 2005, the European Union launched the EU-ETS as a policy instrument to mitigate global climate change. The scheme is based on the "cap and trade" principle, according to which there is a "cap", or limit, on the total amount of GHG that can be emitted by the installations under the system. Within this cap, firms that operate such installations receive emission allowances (also called emission rights) that can be spent or traded, as needed. The limit on the total number of allowances available ensures that they have a market value, being their price determined by supply and demand. Since carbon dioxide (CO2) is the principal greenhouse gas, this is known as the "carbon market".

The purpose of EU-ETS is to generate a price signal, the carbon price, strong enough to drive investment, production and consumption decisions towards a low-carbon economy. Within this policy, carbon financial accounting and reporting could be an important tool to reduce emissions by clearly releasing costs of carbon to stakeholders so that they could incorporate this information in strategic decision-making. However, EU-15 firms under IFRS have no mandatory guidance on how to report emission allowances in their annual accounts. The only exception is Spain, where national accounting dispositions on emission allowances are mandatory to entities operating installations linked to the Spanish allowances allocation plan, regardless if they draw up their financial statements under national GAAP or under IFRS.

Accounting for GHG emission allowances raises two central questions: what are the appropriate recognition and measurement models for allowances held and for the obligation to deliver allowances. In IFRIC 3, withdrawn by the IASB in 2005, the consensus was that a "cap and trade" scheme gives rise to an asset for allowances held, a government grant for allowances issued for less than their fair value, and a liability for the obligation to deliver allowances measured at market price at year-end. In particular, under the cost model provided by this Interpretation, allowances granted at no cost are measured at fair value at grant date while the liability to deliver allowances is measured at fair value at the year-end. This mixed measurement leads to the appearance in the

income statement of a profit or loss due to changes in allowances' market price during the period.

Since the launch of EU-ETS, in 2005, the majority of allowances were granted for free. Consequently, the valuation of those allowances at fair value at grant date, instead of a nominal amount (IAS 20, § 23) of nil value, would have a significant impact in the accounts of the firms under the scheme. Additionally, the recognition of assets and liabilities with different valuation bases would produce volatility of results for these firms, especially if intensive carbon emitters. These two aspects lead to lobbying for the withdrawal of IFRIC 3 (Bebbington and Larrinaga-González, 2008) and for the recognition and reporting of the net position with respect to emission allowances. According to this approach, only purchased allowances would have an impact on the balance sheet, and a liability is recognized merely to the extent that actual emissions exceed licenses allocated free of charge.

Due to the lack of specific guidance, divergent accounting practices have emerged following the withdrawal of IFRIC 3 (PwC and IETA, 2007; Lovell *et al*., 2010; Black, 2013; Haupt and Ismer, 2013; Giner, 2014). Their implications may be significant not only for the financial position and performance reported in the annual accounts, but also on how a firm may decide to manage GHG emission allowances. In view of this, the information provided in the explanatory notes is of major importance for users to evaluate firms' performance in terms of carbon emissions. According to Lovell and Mackenzie (2011, p. 727) some firms under the scheme have advocated a readiness for clear guidance from standard-setting bodies "so that companies can be fairly compared with their competitors, creating a level playing field". As described by Giner (2014, p. 47), the majority of firms have been following a net approach on accounting for GHG emission allowances according to which "if some conditions are met, carbon remains invisible" in firms' accounts.

The relevance of carbon financial accounting is increasing as the scope of EU-ETS expands (either directly through the inclusion of more sectors in the scheme, or indirectly through the inclusion of other GHG), and the EU-ETS third trading period (2013-2020) brought again into discussion the need for formal guidance on accounting for emission allowances (ANC, 2012; EFRAG, 2012).

Concurrently, some literature on international accounting harmonization supports that the diversity or the absence of accounting standards does not necessarily imply the diversity of practices. In particular, the globalization of capital markets and the internationalization of firms are singled out in literature as factors that may lead to voluntary harmonization (Emenyonu, 1993; Cañibano and Mora, 2000; Rahman *et al*., 2002). In turn, some research suggests that national accounting standards, in spite of no longer applying to the consolidated statements of EU listed firms since 2005, may explain some continued dissimilarities in their reporting practices (Nobes, 2006, 2008; Kvaal and Nobes, 2010), namely on the level of environmental disclosure (Barbu *et al*., 2014). However, most of multi-country studies examining disclosure practices of EU firms applying IFRS do not consider discrepancies in national accounting guidance. Moreover, as regards harmonization studies, while numerous research has been conducted on the harmonization of measurement practices, investigation concerned with the harmonization of disclosure is scarce (Emenyonu and Gray, 1996; Ali, 2006).

Against this background, this study fills a gap in literature in two different ways: primarily, by linking international accounting harmonization with environmental disclosure; additionally, taking into consideration the existing accounting guidance, in firms' home-country, mandatory, or not, for entities under IFRS. The aim is twofold: to confirm the existence of a "disciplinarian effect" of accounting standards; and, to test the existence of a "disciplinarian effect" of markets, both concerning *disclosure on GHG emission allowances in the annual accounts* (carbon financial disclosure). Acknowledging that, in general, high harmony levels are more likely to occur when there is low release of information (Rahman *et al*., 2002), the analysis focus both the level of disclosure and the level of harmony (in disclosure), in order to fully evaluate the "disciplinarian effect" of standards and markets on the dissemination of further and more comparable information on GHG emission allowances in the annual accounts.

In addition, regulatory influences coming from industry affiliation are also considered. At EU level, high carbon intensive firms are subject to further sector-level regulations on their emissions. Therefore, they face more scrutiny and institutional pressure (Stanny and Ely, 2008) and are more likely to have created routines to collect and treat information on GHG emission allowances, than less pollutant activities, being that

routine is a significant predictor of environmental disclosure (Al-Tuwaijri *et al*., 2004; Cormier *et al*., 2005; Aerts *et al*., 2006; Brouhle and Harrington, 2009; and Stanny, 2013). On the other hand, harmony is likely to occur at industry level, since sector-level institutions play a key role in the diffusion of minimum standards for corporate social responsibility (Jackson and Apostolakou, 2010). Bearing this in mind, this study tests industry effects over the harmony in, and the level of carbon financial disclosure.

In order to accomplish the study objectives, a sample of 168 EU-15 listed firms, covered by EU-ETS, was considered over an eight-year period (2005-2012), amounting to 1 344 firm-year observations.

To examine the existence of a "disciplinarian effect" of accounting guidance, sample firms were classified according to the type of guidance they face in home-country on how to report GHG emission allowances in the annual accounts: under no specific guidance (scenario A); under guidance, though not mandatory for entities under IFRS (scenario B); under mandatory guidance (scenario C). Additionally, a distinction between detailed and not detailed guidance on disclosure items was made, arriving at four scenarios (A - no guidance | B1 - not mandatory not detailed guidance | B2 - not mandatory detailed guidance | C - mandatory (detailed) guidance).

To test the existence of a "disciplinarian effect" of markets, sample firms under no mandatory regime on accounting for GHG emission allowances were organized according two dimensions: entities acting internationally (i) through the capital markets, according to the firm's listing status; or, (ii) through the markets of products and services rendered by each firm, according to the geographical location of its customers.

For the purpose of measuring firms' level of disclosure, a disclosure index (dichotomous, unweighted, and adjusted for non-applicable items) has been constructed. Then, a set of multilevel (hierarchical) models were estimated to examine the effects of firm-level and country-level explanatory variables on carbon financial disclosure, and to test if the explanatory variables at the country-level (type of guidance) serve as moderators of the firm-level relationships between internationalization and disclosure.

For the purpose of measuring harmony (comparability) of firms' accounts, T indices

(Taplin, 2004) were computed for different groups of firms (sorted according the relevant criteria to test research questions), as well as for the whole sample to evaluate harmony of disclosure practices at EU-15 level (T overall). In all cases, to assure that the harmonization towards a more informative policy gets a higher score, different levels of comparability are allocated to different disclosure methods in accordance with the extent of information provided by each method. Also, it should be added that this study offers innovative contributions to the research area of accounting harmonization measurement in several ways.

First, unlike most of prior studies that assess harmony of accounting practices in a single year or in two different points in time, the present investigation fully covers an eight-year period, what allows conducting regression analysis to test jointly trends on harmonization and differences in the level of harmony between subsamples.

Second, a technique was developed to control for industry effects within the T index. Since EU-ETS incidence varies across industries, and industry was identified as a significant predictor of disclosure, the assessment of differences in the levels of harmony focused only on "unadjusted" T indices (Taplin, 2004) could be misleading when comparing subsamples with dissimilar industry composition. So, a technique was developed to compute an adjusted T index, in order to control for industry effects. This method has the advantage of preserving sample size, as it does not require the arbitrary exclusion of some observations. To the best of my knowledge, this procedure innovates by exploring the flexibility of the T index to control for industry effects.

Third, unlike previous research that measures harmony on an item-by-item basis (i.e., presenting a separate index for each item of disclosure), this study considers an aggregate approach, by summarizing in a single T index the comparability of all the items classified as minimum information required to evaluate firms' performance in terms of GHG emissions and to project future cash flows (EFRAG, 2012). To the best of my knowledge, the present analysis innovates by incorporating in a single T index the measurement of disclosure harmony for all the topics under consideration.

Consistent with prior investigation on environmental disclosure (Deegan, 2002; Cormier *et al*., 2005; Chen and Roberts, 2010), a multi-theoretical framework is

adopted to address research questions, assuming that corporate disclosure is an outcome of management's assessment of economic incentives, public pressures, and institutional constraints. It is beyond the scope of this study to fully investigate patterns of disclosure across different national institutional environments. However, considering that macro-level factors (e.g., culture, form of equity market, or sociopolitical variables) are likely to affect the ways in which firms communicate with stakeholders (Midttun *et al*., 2006; Freedman and Jaggi, 2005, 2011; Carnevale *et al*., 2012; Faisal *et al*., 2012), the influence of institutional environment in firms' home-country is also incorporated in the analysis when examining levels of carbon financial disclosure among EU-15 firms.

Findings allow admitting that mandatory guidance exerts a significant "disciplinarian effect" over carbon financial disclosure, by improving both the harmony in, and the level of disclosure on GHG emission allowances in the annual accounts. On average, over the eight-year period, the disclosure index, and the T index reached significantly higher scores under mandatory guidance (scenario C), than among all and each one of the other scenarios under review.

The positive association between mandatory guidance and level of disclosure is consistent with prior literature. In accordance with Diamond and Verrecchia's (1991) model, a firm's optimal level of disclosure is achieved when the marginal cost of disclosure is equal to its marginal benefit. As described by Seah and Tarca (2006), under mandatory guidance, costs of disclosure are likely to be greater because, to avoid possible penalties, more proprietary information is revealed which could damage a firm's wealth and reputation, and benefits of disclosure are potentially superior because compulsory information has more credibility especially when it is certified. As a result, under a mandatory regime, both the costs and the benefits of release potentially increase, changing the equilibrium point, and expanding the level of a firm's disclosure. Likewise, on the view of stakeholder theory, mandatory guidance is a potential driver of disclosure, because it is likely to attract the attention of powerful stakeholders, putting further pressure on firms to disclose more. On the other hand, in line with stakeholder theory and institutional theory, findings also suggests that, by compelling firms to follow mandatory benchmarks, mandatory guidance is more likely to enhance the harmony in carbon financial disclosure, than non-mandatory regimes.

Additionally, a more in-depth analysis on the nature of disclosure (quantitative *versus* qualitative) reveals that, although not ensuring full compliance, mandatory guidance seems to exert the major "disciplinarian effect" on the dissemination of quantitative (*hard*) items, precisely the kind of disclosure that firms are less willing to reveal as it conveys more proprietary information (Cho and Patten, 2007; Cormier *et al*., 2009). These outcomes are important for regulatory bodies aimed at enhance utility and relevance of financial statements. It is essential that firms provide quantitative (monetary and non-monetary) disclosure on their efforts and achievements in reducing GHG emissions, namely to assist investors in assessing the trade-off between risk and return (Freedman and Jaggi, 2005, 2011), to provide the information that users need to project future cash flows (EFRAG, 2012), and to evaluate firms' environmental and financial performances. To this end, evidence suggests that mandatory guidance is needed because, otherwise, the level of carbon financial disclosure, especially on quantitative items, is predicted to be significantly lower.

As expected, in the opposite pole lies the scenario of no guidance on how to report GHG emission allowances in the annual accounts (scenario A), where the level of disclosure and the level of harmony are the weakest ($p<0,01$) of all the scenarios under consideration. In the intermediate position is the case of local guidance not mandatory for entities applying IFRS (scenario B).

Then, a thorough analysis of scenario B (not mandatory guidance) allows admitting that the level of disclosure and the level of harmony are likely to be higher among firms domiciled in countries where national guidance on accounting for GHG emission allowances specifies detailed requests for disclosure items (scenario B2), than under not mandatory guidance that does not set out detailed dispositions for disclosure (scenario B1). These outcomes are not dissenting from previous research on mandatory guidance (e.g., Criado-Jiménez *et al*., 2008; Peters and Romi, 2013) pointing out that regulations are more effective when they clearly delineate disclosure items to be reported, and expand prior investigation, by suggesting that the same applies to non-mandatory guidance. From stakeholder theory standpoint, local guidance establishing detailed benchmarks for disclosure, though non-mandatory, help to inform the public opinion on disclosure best practices, and contribute to raise awareness among stakeholders about

the relevant information to be provided in the annual accounts. Moreover, detailed benchmarks are likely to boost stakeholders' perception that lack of critical information may well correspond to bad news. As a consequence, detailed guidance, though not mandatory, may exert pressure for additional disclosure by firms looking for stakeholders' approval, and not wanting to incur the costs of bad reputation.

On the other hand, it should be noted that, even for the scenarios of non-mandatory guidance (scenario B1 | scenario B2), higher levels of disclosure are associated with higher levels of harmony. This is a departure from Rahman *et al*.'s (2002) prediction that additional information is generally associated with lower comparability of firms' accounts. Contrarily, evidence from this study indicates that when increased disclosure is induced by formal guidance, even not mandatory, higher (not lower) levels of harmony in disclosure are likely to occur.

Altogether, findings suggest that accounting standards, even those not mandatory for firms under IFRS, have a significant positive impact over carbon financial disclosure, being that major improvements on the disclosure index and in the T index are likely to occur under mandatory guidance followed by the scenario of not mandatory guidance comprehending detailed benchmarks for disclosure. These results are consistent with previous research indicating a noteworthy impact of standards on the level of disclosed environmental information (e.g., Deegan and Rankin, 1996, 1997; Owen *et al*., 1997; Larrinaga *et al*., 2002; Criado-Jiménez *et al*., 2008; Barbu *et al*., 2014), and are in line with stakeholder theory and institutional theory.

From stakeholder theory standpoint, disclosure is a strategic response to manage or to handle stakeholders' demand for information, in order to obtain their approval. In the extent that formal guidance, even not mandatory, is likely to rise stakeholder awareness of the risks, and the associated mitigation efforts, that GHG emissions pose to firms, it contributes to increase their quest of information. As a consequence, in order to respond to greater stakeholders' pressure, management is encouraged to disclose more than under no guidance, especially when accounting standards specify detailed dispositions on items to be reported in the annex. In particular, when comparing all the scenarios under review, evidence allows admitting that mandatory guidance (enhancing stakeholders' perception of the relevant information concerning GHG emission

allowances) is more likely to compel EU-15 firms to expand the level of carbon financial disclosure, most probably to respond to the information needs of more aware stakeholders, as well as, to avoid the costs of bad reputation that would be derived from simply ignore the norm.

Likewise, the importance of formal guidance (mandatory or non-mandatory) as a driver of additional disclosure is in line with institutional theory. Under mandatory guidance, organizations are made more aware of public interests and are less likely to respond defiantly because the consequences of noncompliance are "more tangible and often more severe" (Oliver, 1991, p. 168), than under no mandatory regime. On the other hand, from institutional theory standpoint, institutional pressures may occur not only by means of legal regulation and enforcement but also by a process of voluntary diffusion.

As anticipated by Oliver (1991), when rules or norms are broadly diffused and supported, organizations are more likely to acquiesce to institutional pressures because their social validity is largely unquestioned. On this view, findings suggest that EU-15 firms domiciled in countries that ratified the Kyoto Protocol and issued formal guidance on how to report GHG emission allowances in the annual accounts appear to perceive that disclosure of financial information concerning GHG emission allowances would be important for their public image, as the efforts in meeting Protocol's targets and the release of information on costs of carbon are valued by society. In these circumstances, institutional theory predicts a low degree of organizational resistance towards mandatory guidance, and results confirm that, even not ensuring full acquiescence, mandatory guidance on accounting for GHG emission allowances is significantly associated with less withholding of information, than any other scenario under review.

As regards to the case of guidance not mandatory for firms applying IFRS, a process of voluntary diffusion seems to be in place, at country level, with firms under IFRS following their home-country guidance intended only for entities under national GAAP. That is, in line with Oliver's (1991) prediction, evidence indicates that when firms anticipate that conformity with social expectations, even though set out by non-mandatory guidance, will enhance social fitness, a process of voluntary diffusion, through imitation, is more likely to occur, than under no guidance. Hence, as predicted, results show significantly higher levels of harmony along with higher levels of

disclosure among firms domiciled in countries where national guidance was issued, though not mandatory for entities under IFRS, than among firms domiciled in countries where no guidance on accounting for GHG emission allowances was provided.

These outcomes have important implications for regulatory bodies aimed at enhance the comparability of financial reporting within EU. Expanding the assumption formulated by Nobes (2006, 2008), Kvaal and Nobes (2010), and Barbu *et al*. (2014), this study suggests that disclosure practices of EU-15 firms applying IFRS are likely to be affected by domestic guidance not intended for them. Consequently, cross country differences within EU-15 are probable to remain, in spite of the compulsory use of IFRS for the consolidated statements of listed firms since 2005. Actually, unlike most of multi-country studies that ignore discrepancies in national accounting guidance when examining European firms under IFRS, this study expands prior research, by showing that national guidance is the most significant predictor in explaining variance between countries, at EU-15 level. In particular, after adding to the model the explanatory variables representing national guidance, the remaining unexplained variance between countries is no longer significant. Furthermore, estimation results also indicate that the effects of national guidance are superior to those of institutional environment (type of business system). Largely, results indicate that national guidance, though not mandatory, exerts a major influence on disclosure practices of EU-15 firms applying IFRS. Consequently, discrepancies among national legal requirements are able to penalize the comparability of firms' accounts and inhibit the process of *de facto* (material) accounting harmonization within EU, in spite of the compulsory use of the same set of standards (IFRS) for the consolidated statements of listed firms since 2005.

As regards industry affiliation, evidence confirms the prediction that higher levels of disclosure and harmony are more likely to occur in high carbon intensive industries, than in low carbon intensive industries. In fact, among all the firm-level predictors, industry affiliation is the one that added the major contribution in explaining within countries variance, and exhibits the strongest association with the level of carbon financial disclosure. In addition, results point out that convergence of practices is likely to occur at industry level, since harmony in disclosure is significantly higher within industries, than between industries.

These findings are in line with previous evidence from Cowan and Deegan (2011), and Choi *et al*. (2013), suggesting that in response to either increased social and political pressures or due to strict sector-level regulations, firms in high carbon intensive industries are more likely to provide additional disclosure on GHG emissions. In accordance with stakeholder theory, outcomes corroborate that, all else equal, firms perceived as high GHG emitters by society are more likely to use disclosure as a legitimizing tool in front of various stakeholders, namely providing more quantitative (*hard*) disclosure than firms operating in low carbon intensive activities. Likewise, in the lens of institutional theory (Oliver, 1991), the more an organization anticipates that conformity will enhance social fitness, the less a dismissal strategy is likely to occur. Results confirm this hypothesis suggesting that high carbon intensive firms (for which a greater legitimacy reward is perceived to be attainable from the conformity to mandatory or non-mandatory guidance on accounting for GHG emission allowances) are more likely to conform to institutional pressures, by means of higher levels of disclosure, than firms operating in less pollutant activities. In the same vein, according to agency theory and proprietary costs theory, high GHG emitters, facing a legitimacy threat due to their activities, have more to gain by providing voluntarily information on GHG emission allowances, and, in line with Diamond and Verrecchia's (1991) model, results suggest that, all else equal, high carbon intensive firms (with greater potential benefits from carbon financial disclosure) tend to disclose more.

On the other hand, findings support Jackson and Apostolakou's (2010) assumption that harmony is likely to occur at industry level, since firms operating in the same industry face common legitimization challenges, are affected by similar sectorial regulations, and tend to imitate competitors' behavior either at national or international level. In particular, these outcomes have important implications for future research on the area of accounting harmonization measurement, by confirming that comparisons between subsamples with different industry composition must be validated through the assessment of adjusted T indices, in order to control for industry effects.

Another determining factor pointed out in literature as enhancing corporate disclosure is the internationalization of firms. However, extending the hypotheses formulated by Oliver (1991) to an international environment, the lack of international consensus

regarding either the commitment to the Kyoto Protocol or the appropriate accounting model for emissions trading schemes, do not favor a process of voluntary dissemination of carbon financial disclosure by EU-15 multinational firms. As advanced by Oliver (1991), when rules and norms are not broadly diffused or supported by society, organizations are less likely to respond to institutional pressures because their social validity is questioned, and, consequently, voluntary diffusion is unlikely. In line with Oliver's (1991) prediction, results indicate that firms' internationalization, through the capital markets or through foreign sales, is not able to put forth, by itself, a "disciplinarian effect" over carbon financial disclosure.

With regard to the internationalization through the capital markets, it should be noted that almost all foreign listed firms in the sample are registered in US stock exchanges. Consequently, for EU-15 firms (domiciled in countries that ratified the Kyoto Protocol) the internationalization through the quotation in US stock exchanges (a country that has not ratified the Protocol) does not seem to exert further pressure (in addition to the existing in firms' home-country) to enhance carbon financial disclosure. In the lens of stakeholder theory and institutional theory, results suggest that, as foreign listed firms realize that this particular information is not broadly valued by their foreign stakeholders, to be accountable in front of a wider stakeholders audience is not enough to motivate, by itself, higher levels of harmony or higher levels of disclosure on GHG emission allowances. That is, as international pressures coming from the host country (US) are lower than domestic constraints, internationalization through capital markets is not likely to exert, *de per se*, a significant "disciplinarian effect" over carbon financial disclosure. So, when considering either the harmony in, or the level of carbon financial disclosure, results indicate that, *ceteris paribus*, EU-15 firms listed abroad are not likely to perform significantly different than EU-15 firms listed only in domestic markets.

As regards the internationalization through foreign sales, findings allow admitting that, ultimately, the improvement on the level of carbon financial disclosure among firms operating internationally is triggered by the type of guidance in their home-country. As advanced by Drezner (2001), despite the worldwide public concern over climate change and the need to limit GHG emissions, some skepticism has surrounded Protocol's application, being that the heavier burden it imposes on developed countries allegedly

led to the lack of engagement of major GHG emitters. Actually, EU-ETS is the largest system in operation and, outside the EU, only three other emissions trading schemes were initiated, over the research period, at national level, being one of them on a voluntary basis. In view of this, results suggest that, due to multiplicity and fragmentation of foreign stakeholders (lack of broadly diffused or widely validated values, norms and practices concerning emissions trading schemes), international pressures to disclose costs of carbon are not perceived by EU-15 firms as more convincing than domestic constraints. Hence, extending Oliver's (1991) assumptions to an international environment, EU-15 firms operating globally are deemed to respond primarily to domestic institutional pressures, from which organizational dependencies are deemed to be higher, namely as regards the allocation of free allowances or the control of GHG emissions.

Accordingly, disclosure strategies of EU-15 firms exposed to foreign markets are primarily driven by guidance in home-country. That is, following general patterns of disclosure identified earlier, under not mandatory detailed guidance the improvement on the level of disclosure is more likely to occur by means of more qualitative information while the release of quantitative data is more likely to take place under mandatory guidance. In turn, when there is no specific guidance in the firm's home-country or when existing guidance does not specify the items to be disclosed, firms' skepticism about the strategic utility of carbon financial disclosure as a tool to manage a multiplicity of foreign stakeholders seems to inhibit further improvements on the level of disclosure among EU-15 firms with higher international activity. Hence, all else equal, the levels of disclosure among them are not significantly different from those of EU-15 firms operating mainly in domestic markets. Moreover, when analyzing harmony in carbon financial disclosure, results indicate that, under no mandatory regime, differences between firms with higher exposure to foreign markets and those with lower exposure to foreign markets are not statistically significant.

Overall, considering the harmony in, and the level of carbon financial disclosure among EU-15 firms, although some progresses were registered along the research period, we arrive at 2012 with 64 sample firms (38%) not disclosing any information on GHG emission allowances in their annual accounts, and only 13 firms (8%) releasing all the

items classified as minimum information required to assist investors in assessing the trade-off between risk and return (Freedman and Jaggi, 2005, 2011), and to project future cash flows (EFRAG, 2012). In particular, with regard to harmony at EU-15 level, the probability that two firms randomly selected have accounts that are comparable (T overall) ranges from, 3,5%, in 2005, to 5,6%, in 2012. Currently, both firms and standard-setting bodies are more conscientious of the urgent need for mandatory guidance on accounting for GHG emission allowances in order to enable comparability of financial statements (Lovell and Mackenzie, 2011; ANC, 2012; EFRAG, 2012; Giner, 2014). Results confirm this view, by suggesting that we cannot rely on a possible "disciplinarian effect" of markets to compel EU-15 firms to disclose further or more comparable information on GHG emission allowances in the annual accounts.

Until now, the orientation in most countries has been to encourage firms to make environmental disclosures instead of mandate them (Choi *et al*., 2013; Giner, 2014). As regards carbon financial disclosure, this study shows that, in the absence of mandatory guidance, completeness and comparability of disclosure are likely to be significantly lower. Findings are in line with earlier evidence (Freedman and Jaggi, 2005, 2011; Cowan and Deegan, 2011; Choi *et al*., 2013), and have important implications for regulators, firms, and stakeholders.

For regulators, results may help develop guidance targeting particular information or activities of greatest importance to stakeholders and where firms could not be relied on to make voluntary disclosures. In particular, outcomes support the need for mandatory guidance with detailed benchmarks for disclosure (not depending on managements' assessment of materially), as regards quantitative items (monetary and non-monetary) informing about (i) the costs of pollution that the firm bears due to its activities, (ii) the value that granted allowances represent and its relative weight to the overall costs of production, (iii) the impact of progressive reductions of free allowances started in the third trading period of EU-ETS, (iv) how far EU-ETS targets were accomplished, or not, (v) how the firm can face its surrendering obligation, (vi) possible capital expenditures to limit or to reduce future GHG emissions, as well as (vii) fines and contingent liabilities related to GHG emissions.

For firms, evidence points out that mandatory guidance would provide a fairer basis to

inform stakeholders about the risks and the opportunities related to carbon emissions, leading to a proper accountability of their strategies to mitigate global warming when compared with competitors.

For environmental stakeholders with a growing concern with global warming, results help to understand how mandatory guidance is more likely to outline costs of carbon to society and, hence, to contribute to more environmentally responsible decision-making.

Third trading period of EU-ETS, which started in 2013 and will last for eight years, has brought a greater scope and complexity to the system. Instead of free allocation of GHG emission allowances, auctioning will be the default method. Acknowledging that in the first two trading periods (2005-2007 | 2008-2012) power generators have been able to pass on the notional cost of GHG emission allowances to customers even when they received them for free[1], for the power generation sector the general rule after 2013 is that EU-15 operators no longer receive any free allowances but have to buy them. As regards to sectors other than power generation, the EU-ETS legislation sets the goal of phasing out free allocation completely by 2027. This means that, as firms have to buy an increasing proportion of GHG emission allowances through auctions, quantitative (monetary and non-monetary) disclosure informing about existing GHG emission allowances granted at no cost is necessary for users to project future cash flows.

Concurrently, efforts are being made at EU level to regulate the mechanisms that ensure the efficiency of the scheme or control for its consequences. In particular, considering that costs of carbon are passed on by electricity producers in their prices, EU-ETS regards the possibility for Member States to provide governmental aid to firms in sectors at significant risk of loss of market share to non-EU competitors due to the higher electricity prices ("carbon leakage") (EC, 2012).

In this context, results point out that mandatory guidance is needed for entities to communicate more objective, credible, and comparable information on their risks and efforts to mitigate global warming resulting from carbon emissions, to make visible the costs of carbon to society, and ultimately to lead investment, production and consumption decisions towards a low-carbon economy, in line with EU-ETS' aim.

[1] http://ec.europa.eu/clima/policies/ets/cap/auctioning/index_en.htm. Last accessed on 19 July 2014.

Nevertheless, it should be noted that, despite being consistent with theories based upon the concept of organizational legitimacy, the above mentioned results must be taken with restraint.

The first obvious limitation of this study is that of scope. The number of countries used for this analysis is limited to EU-15 Member States, and even within these countries the study covers just a sample of firms under EU-ETS. Therefore, any attempt to generalize or extrapolate the results of this study outside this context should be made with caution. The examination of larger samples, different sets of countries, and other accounting disclosure issues are needed to confirm research findings.

Also, further research is needed to evaluate interactions between regulatory background and internationalization of firms' operations. To that end, a finer identification of geographical location of external customers and/or facilities would be of interest to check the robustness of results. In the present investigation data collection was primarily based on firms' annual reports that do not provide exhaustive comparable information on this matter, being this another limitation of this research.

Finally, current changes in international institutional environment, as well as, in domestic guidance on accounting for emissions trading schemes give opportunity for future research in this area. At international level, since 2012, a number of emissions trading schemes were initiated worldwide, namely within the US where policy on global warming seems to have started to change (Simnett *et al*., 2009). More recently, at national level, some more guidance on accounting for GHG emission allowances was issued among EU-15 countries. Hence, there are opportunities for further investigation on how firms respond to changes in home-country guidance; how domestic accounting standards, not intended for firms under IFRS, are likely to influence their disclosure practices and interfere with comparability of firms' accounts within the EU; and how shifts in the relative weight of international pressures when compared with domestic constraints are likely to affect disclosure strategies of firms acting in foreign markets.

Appendix: Methodological note on how to control for industry effects within the T index framework

For illustrative purposes, admit that, for a particular item, three alternative accounting policies (or methods) are available (A, B, C), and that the relative frequency with which firms pertaining to industry *S* apply each one of the methods is as follows: A: 50%; B: 30%; C: 20%; while among firms belonging to industry *Z* the relative frequencies are A: 10%; B: 20%; C: 70%.

Consider a sample composed of 300 firms, half of each industry, and three subsamples with different industry composition, as described in the next table.

Table A-1: Sample composition - Illustrative example (IE)

	Group 1		Group 2		Group 3		Total	
	n	%	n	%	n	%	n	%
Industry S	50	0,50	80	0,67	20	0,25	150	0,50
Industry Z	50	0,50	40	0,33	60	0,75	150	0,50
Total	100	1,00	120	1,00	80	1,00	300	1,00

According to the profile of accounting policy choices among industries *S* and *Z*, it is expected that, in Group 1, the number of firms using accounting policy A equals 30 (0,5x50+0,1x50), the number of firms applying accounting policy B equals 25 (0,3x50+0,2x50), and the number of firms using accounting policy C is of 45 (0,2x50+0,7x50). In Group 2, the expected frequencies of accounting policies A, B, and C are 44 (0,5x80+0,1x40), 32 (0,3x80+0,2x40) and 44 (0,2x80+0,7x40), respectively. Similarly, in Group 3, the expected number of firms applying each accounting policy are 16 (0,5x20+0,1x60), 18 (0,3x20+0,2x60), and 46 (0,2x20+0,7x60) (Table A-2).

To measure harmony, T indices (Taplin, 2004) are computed for each group of firms, by using only data for each group separately, as well as for the entire sample (T overall | Table 3-2 | option 2a), giving equal weight to each firm in the sample (Table 3-2 | option 1a), and assuming that firms using the same accounting policy are completely comparable with each other while firms using different policy choices are completely non-comparable with each other (Table 3-1 | option 3a). Results are presented in the next table.

Table A-2: Sample composition, T index by group of firms, and T overall (IE)

	Group 1	Group 2	Group 3	Overall
Accounting Policy A				
Industry S	25	40	10	75
Industry Z	5	4	6	15
∑AP_A	30	44	16	90
Accounting Policy B				
Industry S	15	24	6	45
Industry Z	10	8	12	30
∑AP_B	25	32	18	75
Accounting Policy C				
Industry S	10	16	4	30
Industry Z	35	28	42	105
∑AP_C	45	44	46	135
Total	100	120	80	300
T index	0,355	0,340	0,421	0,355

Comparisons between subsamples indicate that the highest level of harmony is observed among Group 3 where T index equals 0,421 $((16/80)^2+(18/80)^2+(46/80)^2)$, while firms belonging to Group 2 show the lowest level of harmony with a T index of 0,340 $((44/120)^2+(32/120)^2+(44/120)^2)$. With regard to Group 1, whose industry composition is similar to that one of the full sample, level of harmony equals T overall and is of 0,355 $((30/100)^2+(25/100)^2+(45/100)^2)$. In fact, results are related with the industry composition of each subsample and will be of interest to control for industry effects. That is, to evaluate the relative levels of harmony allowing for similar industry configuration for all groups.

Acknowledging that, in general, the underlying distribution in the population is unknown, sample adjustments in order to achieve a composition similar to that one existing in the entire population cannot be performed. Nevertheless, it is possible to control for industry effects by choosing a control group, and then produce adjustments in the remaining subsamples in order to attain similar industry composition in all groups. For illustrative purposes, Group 1 is selected as the control group, but it should be noted that similar conclusions would be achieved if any other group had been chosen, because, as explained later, after adjusting for industry effects, what will be of interest are not the levels of harmony among each group of firms but their relative scores.

In the illustrative example (Table A-1 | Table A-2), industries *S* and *Z* are over represented, in Groups 2 and 3, respectively, by comparison with the control group (Group 1).

In Group 2, 80 firms pertain to industry *S*, and when computing unadjusted T index, the weight given to each one was of 0,0083(3) (80/120/80). To achieve in Group 2 a composition similar to that one observed in the control group, the number of firms pertaining to industry *S* must total 60 (50/100x120), and, therefore, when computing an adjusted T index, the weight given to each one must equal 0,00625 (60/120/80). Consequently, by applying in Group 2 an adjustment factor of 0,75 (60/80 or 0,00625/0,0083(3)) to each observation belonging to industry *S*, it is possible to encompass all the 80 firms included in the initial sample, not neglecting the information they convey but "compressing" it. On the other hand, in Group 2, the adjustment factor for observations related do industry *Z* will be as of 1,5 (50/100x120/40) to correct for their under-representation among this subsample.

Similarly, in Group 3, the adjustment factor for each observation pertaining to industry *Z* will be as of 0,67 (50/100x80/60), in order to retain all the 60 firms pertaining to this industry but correct their relative weight as if they were 40 (50/100x80). Finally, the adjustment factor to correct frequency of industry *S* in Group 3 will be as of 2 (50/100x80/20).

For the computation of the adjusted T indices, the proportions of firms applying each accounting method are based on these absolute adjusted frequencies. Table A-3 summarizes subsample composition and T indices, after the adjustments to control for industry effects.

According to the adjusted T indices (Table A-3), levels of harmony among subsamples are equal to each other (0,355), meaning that the differences observed when analyzing unadjusted T indices, in the previous stage, were due to dissimilarities in the subsamples with regard to industry composition.

It should be noted that the score of the adjusted T index will depend on the subsample that is chosen as the control group. If Group 2 or Group 3 have been picked as the

control group, instead of Group 1, results for the adjusted T indices would be of 0,340 and 0,421, respectively, for all subsamples. So, the levels of harmony would be different but inference regarding comparisons between subsamples would be unchanged, because for comparative purposes, the absolute levels are not relevant, what matters are relative scores. That is to say, regardless of the subsample that it is selected as the control group, this procedure will always arrive to adjusted T indices equal to each other, for all subsamples in this illustrative example, confirming that, in the present case, differences in the levels of harmony when considering unadjusted T indices were due to dissimilarities in their industry composition.

Table A-3: Sample composition and T indices after adjusting for industry effects (IE)

	Group 1	Group 2			Group 3			Overall	
	Control Group	G2_Unadj (1)	Adj_Factor (2)	G2_Adj (1) x (2)	G3_Unadj (3)	Adj_Factor (4)	G3_Adj (3) x (4)	Total_Unadj	Total_Adj
Accounting Policy A									
Industry S	25	40	0,75 (i)	30	10	2 (iii)	20	75	75
Industry Z	5	4	1,50 (ii)	6	6	0,67 (iv)	4	15	15
∑AP_A	30	44		36	16		24	90	90
Accounting Policy B									
Industry S	15	24	0,75 (i)	18	6	2 (iii)	12	45	45
Industry Z	10	8	1,50 (ii)	12	12	0,67 (iv)	8	30	30
∑AP_B	25	32		30	18		20	75	75
Accounting Policy C									
Industry S	10	16	0,75 (i)	12	4	2 (iii)	8	30	30
Industry Z	35	28	1,50 (ii)	42	42	0,67 (iv)	28	105	105
∑AP_C	45	44		54	46		36	135	135
Total	100	120		120	80		80	300	300,0
T index	0,355	0,340			0,421			0,355	
T index_adjusted				0,355			0,355		0,355

(i) 50/100x120/80 = 0,75 | (ii) 50/100x120/40 = 1,5 | (iii) 50/100x80/20 = 2 | (iv) 50/100x80/60 = 0,66(6)

The adjustment factors computed in the previous example, for each industry in every subsample under adjustment, are based on the relation between the original number of observations and the number of observations corresponding to the weight as of the control group. So, when some groups comprise zero occurrences for some industries, a different approach to control for industry effects has to be applied.

For illustrative purposes, consider the sample composition presented in the next table, where Group 3 includes no observations for firms belonging to industry *S*.

Table A-4: Sample composition with zero frequencies of industry *S* in Group 3 (IE)

	Group 1		Group 2		Group 3		Total	
	n	%	n	%	n	%	n	%
Industry S	50	0,50	80	0,67	0	0,00	130	0,43
Industry Z	50	0,50	40	0,33	80	1,00	170	0,57
Total	100	1,00	120	1,00	80	1,00	300	1,00

In this scenario, factor adjustments for non-zero occurrences of industries *S* and *Z* are computed as mentioned in the previous example. With regard to zero frequencies of industry *S* in Group 3, they must be replaced by the ones that would be expected if the composition of this subsample was similar to that one observed in the control group. Considering that in the control group the number of firms pertaining to industry *S* applying accounting policy A is of 25, the expected number of firms applying this accounting policy in Group 3 amount to 20 (80x25/100). Likewise, the expected number of firms from industry *S* applying accounting policies B and C, in Group 3, equals 12 (80x15/100), and 8 (80x10/100), respectively.

As expected, after adjusting for industry effects, levels of harmony among subsamples are equal to each other and similar to the ones obtained in the previous illustrative example (0,355), as shown in the next table.

Table A-5: Sample composition, and T indices after adjusting for industry effects, in the case of zero frequencies of industry *S* in Group 3 (IE)

	Group 1	Group 2			Group 3			Overall	
	Control Group	G2_Unadj (1)	Adj_Factor (2)	G2_Adj (1) x (2)	G3_Unadj (3)	Adj_Factor (4)	G3_Adj	Total_Unadj	Total_Adj
Accounting Policy A									
Industry S	25	40	0,75 (i)	30	0	---	20 (iv)	65	75
Industry Z	5	4	1,50 (ii)	6	8	0,5 (iii)	4	17	15
∑AP_A	30	44		36	8		24	82	90
Accounting Policy B									
Industry S	15	24	0,75 (i)	18	0	---	12 (v)	39	45
Industry Z	10	8	1,50 (ii)	12	16	0,5 (iii)	8	34	30
∑AP_B	25	32		30	16		20	73	75
Accounting Policy C									
Industry S	10	16	0,75 (i)	12	0	---	8 (vi)	26	30
Industry Z	35	28	1,50 (ii)	42	56	0,5 (iii)	28	119	105
∑AP_C	45	44		54	56		36	145	135
Total	100	120		120	80		80	300	300
T index	0,355	0,340			0,540			0,368	
T index_adjusted				0,355			0,355		0,355

(i) 50/100x120/80 = 0,75 | (ii) 50/100x120/40 = 1,5 | (iii) 50/100x80/80 = 0,5 | (iv) 80x25/100 =20 | (v) 80x15/100 = 12 | (vi) 80x10/100 = 8

In summary, the procedure introduced in this study to control for industry effects within the T index framework is the following:

1. Identification, in each subsample, of the firms belonging to each industry and the accounting policy (method) they are applying.

2. Selection, among subsamples, of a control group (CG) suited to the aim of the study.

3. Introduction of adjustments in the remaining subsamples (G*j*) simulating for all groups an industry composition similar to that of the control group, which involve:

   a. For non-zero frequency cases concerning industry composition, apply to every industry in each group the following adjustment factor:

$$Adj\ Factor\ Si\ Gj\ = \frac{proportion\ of\ firms\ from\ industry\ Si\ in\ the\ control\ group}{proportion\ of\ firms\ from\ industry\ Si\ in\ the\ group\ Gj}$$

   where:

   Adj Factor S*iGj* is the adjustment factor for industry S*i* in the group G*j*.

   b. For zero-frequency cases concerning industry composition, replace zero frequencies by the ones that would be expected if the industry composition of the subsample under adjustment was similar to that one of the control group:

$$Adj\ Freq\ Si\ Gj, APk\ = \frac{Si_{CG,APk}}{\sum S_{CG}} \times \sum S_{Gj}$$

   where:

   Adj Freq S*i Gj*,AP*k* is the expected number of firms from industry S*i* applying accounting policy *k* in the subsample G*j* when simulating an industry composition for G*j* similar to that one of the control group.

   $Si_{CG,APk}/\Sigma S_{CG}$ is the proportion of firms from industry S*i* in the control group that use accounting policy *k*.

   ΣS_{Gj} is the total number of firms (for all industries) in the subsample G*j*.

4. Computation of adjusted T indices based on the proportion of firms applying each accounting policy (method) in each group considering their absolute adjusted frequencies.

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Annex I: List of sample firms

Austria
1 AGRANA Beteiligungs AG
2 EVN AG
3 Lenzing AG
4 Mayr-Melnhof Karton AG
5 OMV AG
6 Semperit AG Holding
7 Verbund AG
8 Voestalpine AG
9 Wienerberger AG

Belgium
10 Agfa-Gevaert NV
11 Fluxys SA
12 NV Bekaert SA
13 PinguinLutosa NV
14 Solvay SA
15 Tessenderlo Chemie NV
16 UCB SA
17 Umicore SA

Denmark
18 Arkil Holding A/S
19 Brødene Hartmann A/S
20 Carlsberg A/S
21 Danisco A/S
22 Egetæpper A/S
23 Harboes Brewery A/S
24 Novo Nordisc A/S
25 Novozymes A/S

Finland
26 Atria Plc
27 Fortum Oyj
28 Kemira Oyj
29 Metso Corporation
30 Neste Oil Corporation
31 Outokumpu Oyj
32 Rautaruukki Corporation
33 Stora Enso Oyj
34 UPM-Kymmene Corporation

France
35 Alstom SA
36 AREVA SA
37 Arkema SA
38 Bonduelle SA
39 Compagnie de Saint-Gobain SA
40 Danone SA
41 EDF - Électricité de France SA

France (cont.)
42 Esso SAF
43 Gascogne SA
44 GDF Suez SA
45 Lafarge SA
46 Michelin SA
47 Peugeot SA
48 Renault SA
49 Sanofi-Aventis SA
50 Total SA
51 Vicat SA

Germany
52 Aurubis AG
53 BASF SE
54 Bayer AG
55 BMW AG
56 Daimler AG
57 E.ON AG
58 EnBW Energie Baden - Württemberg AG
59 Fresenius SE
60 HeidelbergCement AG
61 Henkel AG & Co. KGaA
62 Hochtief AG
63 Infineon Technologies AG
64 MAN SE
65 Merck KGaA
66 RWE AG
67 Salzgitter AG
68 Südzucker AG
69 Thyssenkrupp AG
70 Villeroy & Boch AG
71 VolksWagem AG
72 Wacker Chemie AG
73 Wincor Nixdorf AG

Greece
74 Hellenic Petroleum SA
75 Motor Oil (Hellas) SA
76 Public Power Corporation SA
77 SIDENOR SA
78 Titan Cement Company SA

Ireland
79 CRH plc
80 Elan Corporation plc
81 Glanbia plc
82 Kerry Group plc

(cont.)

Annex I: List of sample firms

Italy

83 ACEA SpA
84 Buzzi Unicem SpA
85 Cementir Holding SpA
86 Enel SpA
87 Eni SpA
88 ERG SpA
89 FIAT SpA
90 HERA - Holding Energia Risorse Ambiente SpA
91 Italcementi SpA
92 La Doria SpA
93 Parmalat SpA
94 Piaggio & C. SpA
95 Reno de Medicis SpA
96 Saras SpA
97 Snam SpA
98 TREVI – Finanziaria Industriale SpA

Netherlands

99 Akzo Nobel NV
100 Crown Van Gelder NV
101 EADS NV
102 Heineken NV
103 Royal DSM NV
104 Royal Dutch Shell NV
105 Royal Philips Electronics NV
106 Royal Ten Cate NV
107 STMicroelectronics NV

Portugal

108 Altri SGPS SA
109 CIMPOR - Cimentos de Portugal SGPS SA
110 EDP - Energias de Portugal SA
111 Galp Energia SGPS SA
112 Portucel - Empresa Produtora de Pasta e Papel SA
113 Semapa - Soc. de Investimento e Gestão SGPS SA
114 Sonae Indústria SGPS SA

Spain

115 Acciona SA
116 Acerinox SA
117 CAF - Construcciones y Auxiliar de Ferrocarriles SA
118 CPV - Cementos Portland Valderrivas, SA
119 Ebro Foods SA
120 Endesa SA
121 Ercros SA
122 FCC - Fomento de Construcciones y Contratas SA
123 Gas Natural SDG SA
124 Grupo Empresarial ENCE SA
125 Iberdrola SA

Spain (cont.)

126 Iberpapel Gestión SA
127 Miquel y Costas & Miquel SA
128 Papeles e Cartones de Europa SA
129 Repsol YPF SA
130 Sacyr Vallehermoso SA
131 Sniace SA
132 Tubacex SA
133 Tubos Reunidos SA
134 Uralita SA
135 Vidrala SA
136 Viscofan SA

Sweden

137 AarhusKarlshamn AB
138 AB Electrolux
139 AB Volvo
140 ABB Ltd
141 Boliden AB
142 Höganäs AB
143 Holmen AB
144 Rottneros AB
145 Sandvik AB
146 Scania AB
147 SSAB AB
148 Swedish Match AB

United Kingdom

149 Associated British Foods Plc
150 AstraZeneca Plc
151 BAE Systems Plc
152 Balfour Beatty Plc
153 BAT Plc
154 BG Group Plc
155 BHP Billiton Plc
156 BP Plc
157 BT Group Plc
158 Centrica Plc
159 Croda International Plc
160 Diageo Plc
161 GlaxoSmithKline Plc
162 Imperial Tobacco Group Plc
163 National Grid Plc
164 Next Plc
165 Premier Foods Plc
166 Severn Trent Plc
167 Tullow Oil Plc
168 Unilever Plc

Annex II: Components of the disclosure index

COMPONENTS OF THE DISCLOSURE INDEX	Score if disclosed		
Information to be provided in accordance with ICAC Resolution (2006)	Quant	Qualit	Total
Items listed in the general provisions of previous standards (IAS 38 | IAS 37 | IAS 20)	**7**	**6**	**13**
IAS 38 Intangible assets - GHG emission allowances			
Accounting policy (IAS 1, §8-e), §103, §108)		1	1
Fair value initially recognised at grant date (IAS 38, §122-c))	1		1
Carrying amount (IAS 38, §122-c))	1		1
Measurement after recognition - cost model or revaluation model (IAS 38, §122-c))		1	1
Gross carrying amount at the beginning and end of the period (IAS 38, §118-c))	1		1
Reconciliation of the carrying amount at the beginning and end of the period (IAS 38, §118-e))	1		1
IAS 37 Provisions - Provision for GHG emissions			
Accounting policy (IAS 1, §8-e), §103, §108)		1	1
Description of the nature of the obligation (IAS 37, §85-a))		1	1
Indication of the uncertainties about the amount or timing of those outflows (IAS 37, §85-b))		1	1
Carrying amount at the beginning and end of the period (IAS 37, §84-a))	1		1
Reconciliation of the carrying amount at the beginning and end of the period (IAS 37, §84-c), §84-d))	1		1
IAS 20 Government grants - GHG emission allowances granted at no cost or below market			
Accounting policy, includind methods of presentation in the financial statements (IAS 20, §39-a))		1	1
The nature and extent of government grants recognised in the financial statements (IAS 20, §39-b))	1		1
Additional summary note in accordance with Article 9th of ICAC Resolution (2006)	**14**	**7**	**21**
Valuation methods and methods applied in charging to profit or loss the emissions made during the year		1	1
GHG emission allowances granted under NAP - Declarative information		1	1
GHG emission allowances granted under NAP for the period 2005-7 | 2008-12 - Physical units	1		1
GHG emission allowances granted under NAP for each year - Physical units	1		1
GHG emission allowances granted under NAP - Currency units	1		1
GHG emissions made during the year - Declarative information		1	1
GHG emissions made during the year - Physical units	1		1
GHG emissions made during the year - Currency units	1		1
GHG emission allowances acquired during the year - Declarative information		1	1
GHG emission allowances acquired during the year - Physical units	1		1
GHG emission allowances acquired during the year - Currency units	1		1
GHG emission allowances sold during the year - Declarative information		1	1
GHG emission allowances sold during the year - Physical units	1		1
GHG emission allowances sold during the year - Currency units	1		1
Excess or shortfall of GHG emission allowances - Declarative information		1	1
Excess or shortfall of GHG emission allowances - Physical units	1		1
Excess or shortfall of GHG emission allowances - Currency units	1		1
Costs incurred as a result of fines or penalties related to greenhouse gas emissions	1		1
Contingent liabilities related to greenhouse gas emissions	1		1
Futures contracts for the acquisition of GHG emission allowances	1		1
Installations or group of facilities covered by EU-ETS		1	1
TOTAL SCORE	**21**	**13**	**34**

Annex III: Descriptive statistics for the main headings of the disclosure index, over 2005-2012 - scenarios A, B, C

Disclosure index	Mean	Std. Dev.	Min	Max
		Scenario A - No Guidance		
IFRS disclosure index (DIFRS)	**0,13**	**0,22**	**0,00**	**0,85**
of which:				
IAS 38	0,12	0,21	0,00	1,00
IAS 37	0,15	0,25	0,00	1,00
IAS 20	0,14	0,23	0,00	0,50
ICAC disclosure index (DICAC)	**0,11**	**0,20**	**0,00**	**0,86**
of which:				
Valuation methods applied	0,25	0,43	0,00	1,00
Allowances granted	0,10	0,22	0,00	1,00
Emissions made	0,10	0,22	0,00	1,00
Allowances acquired	0,10	0,24	0,00	1,00
Allowances sold	0,12	0,26	0,00	1,00
Excess/shortfall of allowances	0,05	0,15	0,00	0,67
Fines&Contingent liabilities	0,04	0,13	0,00	0,50
Other	0,13	0,25	0,00	0,87
Overall disclosure index (DISC)	**0,12**	**0,19**	**0,00**	**0,74**
		Scenario B - Not Mandatory Guidance		
IFRS disclosure index (DIFRS)	**0,37**	**0,29**	**0,00**	**1,00**
of which:				
IAS 38	0,34	0,31	0,00	1,00
IAS 37	0,40	0,30	0,00	1,00
IAS 20	0,38	0,29	0,00	1,00
ICAC disclosure index (DICAC)	**0,30**	**0,28**	**0,00**	**0,90**
of which:				
Valuation methods applied	0,59	0,49	0,00	1,00
Allowances granted	0,31	0,32	0,00	1,00
Emissions made	0,29	0,32	0,00	1,00
Allowances acquired	0,28	0,34	0,00	1,00
Allowances sold	0,32	0,37	0,00	1,00
Excess/shortfall of allowances	0,25	0,33	0,00	1,00
Fines&Contingent liabilities	0,08	0,21	0,00	1,00
Other	0,32	0,33	0,00	1,00
Overall disclosure index (DISC)	**0,33**	**0,27**	**0,00**	**0,85**
		Scenario C - Mandatory Guidance		
IFRS disclosure index (DIFRS)	**0,79**	**0,23**	**0,00**	**1,00**
of which:				
IAS 38	0,83	0,29	0,00	1,00
IAS 37	0,69	0,21	0,00	1,00
IAS 20	0,90	0,24	0,00	1,00
ICAC disclosure index (DICAC)	**0,73**	**0,18**	**0,00**	**1,00**
of which:				
Valuation methods applied	0,99	0,11	0,00	1,00
Allowances granted	0,89	0,21	0,00	1,00
Emissions made	0,80	0,23	0,00	1,00
Allowances acquired	0,72	0,25	0,00	1,00
Allowances sold	0,74	0,26	0,00	1,00
Excess/shortfall of allowances	0,77	0,24	0,00	1,00
Fines&Contingent liabilities	0,23	0,42	0,00	1,00
Other	0,62	0,22	0,00	1,00
Overall disclosure index (DISC)	**0,75**	**0,19**	**0,00**	**1,00**

Annex IV: Descriptive statistics for the main headings of the disclosure index, over 2005-2012 - scenarios B1, B2

Disclosure index	Mean	Std. Dev.	Min	Max
		Scenario B1		
		Not Mandatory Not Detailed Guidance		
IFRS disclosure index (DIFRS)	**0,32**	**0,27**	**0,00**	**0,92**
of which:				
IAS 38	0,29	0,27	0,00	1,00
IAS 37	0,35	0,29	0,00	1,00
IAS 20	0,34	0,28	0,00	1,00
ICAC disclosure index (DICAC)	**0,24**	**0,26**	**0,00**	**0,86**
of which:				
Valuation methods applied	0,52	0,50	0,00	1,00
Allowances granted	0,23	0,28	0,00	1,00
Emissions made	0,22	0,29	0,00	1,00
Allowances acquired	0,23	0,32	0,00	1,00
Allowances sold	0,25	0,33	0,00	1,00
Excess/shortfall of allowances	0,21	0,31	0,00	1,00
Fines&Contingent liabilities	0,07	0,18	0,00	0,50
Other	0,26	0,31	0,00	1,00
Overall disclosure index (DISC)	**0,27**	**0,25**	**0,00**	**0,85**
		Scenario B2		
		Not Mandatory Detailed Guidance		
IFRS disclosure index (DIFRS)	**0,54**	**0,30**	**0,00**	**1,00**
of which:				
IAS 38	0,53	0,36	0,00	1,00
IAS 37	0,57	0,31	0,00	1,00
IAS 20	0,50	0,29	0,00	1,00
ICAC disclosure index (DICAC)	**0,51**	**0,25**	**0,00**	**0,90**
of which:				
Valuation methods applied	0,84	0,37	0,00	1,00
Allowances granted	0,58	0,30	0,00	1,00
Emissions made	0,55	0,29	0,00	1,00
Allowances acquired	0,47	0,31	0,00	1,00
Allowances sold	0,59	0,35	0,00	1,00
Excess/shortfall of allowances	0,40	0,32	0,00	1,00
Fines&Contingent liabilities	0,12	0,28	0,00	1,00
Other	0,54	0,30	0,00	1,00
Overall disclosure index (DISC)	**0,52**	**0,24**	**0,00**	**0,85**

Annex V: Pearson correlations' matrices

PANEL A - Correlations of the independent variables

	FSales&Markets	FListing	Industry	Assets	LnAssets	ROA	LEV	OwC
FListing	0,2590 *							
	0,0000							
Industry	-0,2076 *	-0,0147						
	0,0000	0,5896						
Assets	0,1942 *	0,4589 *	0,1299 *					
	0,0000	0,0000	0,0000					
LnAssets	0,3098 *	0,4925 *	0,0475 *	0,6894 *				
	0,0000	0,0000	0,0817	0,0000				
ROA	0,1404 *	0,1472 *	0,0346	0,0368	0,1204 *			
	0,0000	0,0000	0,2046	0,1773	0,0000			
LEV	-0,1161 *	-0,0157	-0,1316 *	0,0558 *	0,0878 *	-0,0251		
	0,0000	0,5656	0,0000	0,0407	0,0013	0,3580		
OwC	-0,1612 *	-0,1246 *	0,0824 *	-0,1661 *	-0,1690 *	-0,1351 *	-0,0996 *	
	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0003	

PANEL B - Correlations of the dependent and independent variables

	FSales&Markets	FListing	Industry	Assets	LnAssets	ROA	LEV	OwC
DISC	-0,2593 *	-0,1334 *	0,4399 *	-0,0747 *	-0,1168 *	-0,1038 *	-0,1281 *	0,1582 *
	0,0000	0,0000	0,0000	0,0062	0,0000	0,0001	0,0000	0,0000
DIFRS	-0,2457 *	-0,1139 *	0,4448 *	-0,0795 *	-0,1243 *	-0,1020 *	-0,1197 *	0,1640 *
	0,0000	0,0000	0,0000	0,0035	0,0000	0,0002	0,0000	0,0000
DICAC	-0,2581 *	-0,1428 *	0,4103 *	-0,0795 *	-0,1243 *	-0,1020 *	-0,1197 *	0,1640 *
	0,0000	0,0000	0,0000	0,0035	0,0000	0,0002	0,0000	0,0000
DQuant	-0,2356 *	-0,1295 *	0,3797 *	-0,0915 *	-0,1792 *	-0,0879 *	-0,1043 *	0,0978 *
	0,0000	0,0000	0,0000	0,0008	0,0000	0,0013	0,0001	0,0003
DQualit	-0,2483 *	-0,1201 *	0,4346 *	-0,0431	-0,0299	-0,1091 *	-0,1328 *	0,1997 *
	0,0000	0,0000	0,0000	0,1138	0,2735	0,0001	0,0000	0,0000

* Correlation is significant at 5% level (2-tailed).

Annex VI: Descriptive statistics for the independent variables, over 2005-2012 - scenario A

	Scenario A No Guidance			
PANEL A				
Continuous variables	**Mean**	**Std. Dev.**	**Min**	**Max**
Foreign Sales (%)	68,9	30,0	0,0	99,0
Foreign Sales&Markets (%)	48,2	29,5	0,0	99,0
Assets (M€)	22 865	45 801	59	369 992
LnAssets	8,7	1,8	4,1	12,8
Turnover (M€)	19 432	51 135	85	470 171
LnTurnover	8,5	1,8	4,4	13,1
Return on Assets (%)	5,5	6,9	(42,1)	32,6
Leverage	2,8	6,0	0,2	116,9
PANEL B				
Non-continuous variables			**N**	**%**
Foreign-Listing				
0 Only domestic stock exchanges			472	79,7
1 Foreign stock exchanges			120	20,3
Industry				
0 Industrials, Consumer G&S, Other			360	60,8
1 Utilities, Oil&Gas, Basic Materials			232	39,2
Ownership concentration				
0 Less than 20% of votes			319	53,9
1 20% of votes or more			273	46,1
Institutional environment				
Coordinated Market Economies (CME)			232	39,2
Mixed Market Economies (MME)			168	28,4
Liberal Market Economies (LME)			192	32,4
Firm-year observations			**592**	**100,0**

Annex VII: Descriptive statistics for the independent variables, over 2005-2012 - scenario B

	Scenario B Not Mandatory Guidance			
PANEL A				
Continuous variables	**Mean**	**Std. Dev.**	**Min**	**Max**
Foreign Sales (%)	72,0	21,7	6,0	98,0
Foreign Sales&Markets (%)	51,0	24,0	1,8	94,0
Assets (M€)	29 494	48 417	112	309 644
LnAssets	9,1	1,6	4,7	12,4
Turnover (M€)	19 709	30 756	147	200 061
LnTurnover	8,9	1,5	5,0	12,1
Return on Assets (%)	3,9	5,0	(28,8)	25,4
Leverage	2,1	1,7	0,4	18,4
PANEL B				
Non-continuous variables			**N**	**%**
Foreign-Listing				
0 Only domestic stock exchanges			485	84,2
1 Foreign stock exchanges			91	15,8
Industry				
0 Industrials, Consumer G&S, Other			312	54,2
1 Utilities, Oil&Gas, Basic Materials			264	45,8
Ownership concentration				
0 Less than 20% of votes			220	38,2
1 20% of votes or more			356	61,8
Institutional environment				
Coordinated Market Economies (CME)			384	66,7
Mixed Market Economies (MME)			192	33,3
Liberal Market Economies (LME)			0	0,0
Firm-year observations			**576**	**100,0**

Annex VIII: Descriptive statistics for the independent variables, over 2005-2012 - scenario B1

	Scenario B1 Not Mandatory Not Detailed Guidance			
PANEL A				
Continuous variables	**Mean**	**Std. Dev.**	**Min**	**Max**
Foreign Sales (%)	72,1	21,8	6,0	98,0
Foreign Sales&Markets (%)	51,7	22,6	1,8	92,0
Assets (M€)	35 617	53 132	112	309 644
LnAssets	9,3	1,6	4,7	12,4
Turnover (M€)	23 726	33 721	147	200 061
LnTurnover	9,1	1,5	5,0	12,1
Return on Assets (%)	3,9	4,7	(28,8)	23,6
Leverage	2,1	1,5	0,4	11,1
PANEL B				
Non-continuous variables			**N**	**%**
Foreign-Listing				
0 Only domestic stock exchanges			360	80,4
1 Foreign stock exchanges			88	19,6
Industry				
0 Industrials, Consumer G&S, Other			264	58,9
1 Utilities, Oil&Gas, Basic Materials			184	41,1
Ownership concentration				
0 Less than 20% of votes			182	40,6
1 20% of votes or more			266	59,4
Institutional environment				
Coordinated Market Economies (CME)			312	69,6
Mixed Market Economies (MME)			136	30,4
Liberal Market Economies (LME)			0	0,0
Firm-year observations			**448**	**100,0**

Annex IX: Descriptive statistics for the independent variables, over 2005-2012 - scenario B2

	Scenario B2 Not Mandatory Detailed Guidance			
PANEL A				
Continuous variables	**Mean**	**Std. Dev.**	**Min**	**Max**
Foreign Sales (%)	71,8	21,6	16,0	96,0
Foreign Sales&Markets (%)	48,5	28,4	3,2	94,0
Assets (M€)	8 062	9 053	290	42 628
LnAssets	8,5	1,0	5,7	10,7
Turnover (M€)	5 649	4 918	148	18 644
LnTurnover	8,2	1,1	5,0	9,8
Return on Assets (%)	3,8	5,7	(10,9)	25,4
Leverage	2,2	2,3	0,4	18,4
PANEL B				
Non-continuous variables			**N**	**%**
Foreign-Listing				
0 Only domestic stock exchanges			125	97,7
1 Foreign stock exchanges			3	2,3
Industry				
0 Industrials, Consumer G&S, Other			48	37,5
1 Utilities, Oil&Gas, Basic Materials			80	62,5
Ownership concentration				
0 Less than 20% of votes			38	29,7
1 20% of votes or more			90	70,3
Institutional environment				
Coordinated Market Economies (CME)			72	56,2
Mixed Market Economies (MME)			56	43,8
Liberal Market Economies (LME)			0	0,0
Firm-year observations			**128**	**100,0**

Annex X: Descriptive statistics for the independent variables, over 2005-2012 - scenario C

	Scenario C Mandatory Guidance			
PANEL A				
Continuous variables	**Mean**	**Std. Dev.**	**Min**	**Max**
Foreign Sales (%)	52,3	19,7	10,0	94,0
Foreign Sales&Markets (%)	27,9	16,1	6,0	91,0
Assets (M€)	13 811	22 805	113	97 016
LnAssets	7,9	1,9	4,7	11,5
Turnover (M€)	7 015	12 672	62	57 740
LnTurnover	7,4	1,8	4,1	11,0
Return on Assets (%)	3,5	4,9	(28,7)	14,5
Leverage	2,1	1,8	0,3	10,6
PANEL B				
Non-continuous variables			**N**	**%**
Foreign-Listing				
0 Only domestic stock exchanges			160	90,9
1 Foreign stock exchanges			16	9,1
Industry				
0 Industrials, Consumer G&S, Other			64	36,4
1 Utilities, Oil&Gas, Basic Materials			112	63,6
Ownership concentration				
0 Less than 20% of votes			81	46,0
1 20% of votes or more			95	54,0
Institutional environment				
Coordinated Market Economies (CME)			0	0,0
Mixed Market Economies (MME)			176	100,0
Liberal Market Economies (LME)			0	0,0
Firm-year observations			**176**	**100,0**

Annex XI: Estimation results for Model 5-3A and Model 5-3B (step 3 intermediate models including time-varying covariates, on a variable-by-variable basis)

Number of observations 1 344		Dependent variable - Overall disclosure index (DISC)			
Number of groups:		Model 5-3A		Model 5-3B	
3rd level (countries) 14		Model 5-2.2 plus		Model 5-2.2 plus	
2nd level (firms) 168		FSales&Markets		FSales&Markets	
Number of occasions: 8 (1st level)				and FListing	
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0173 ***	(0,0031)	0,0169 ***	(0,0031)
	Year_sqr	- 0,0017 ***	(0,0004)	- 0,0016 ***	(0,0004)
	FSales&Markets (FS&M)	- 0,0286	(0,0381)	- 0,0212	(0,0383)
	FListing (FList)			- 0,1151 ***	(0,0336)
	Intercept	0,2456 ***	(0,0565)	0,2640 ***	(0,0555)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0405	(0,0166)	0,0384	(0,0158)
Firm level					
	Variance (_cons)	0,0367	(0,0043)	0,0381	(0,0045)
	Variance (Residual)	0,0051	(0,0002)	0,0051	(0,0002)
Log likelihood		1 274,8		1 280,6	
Deviance		-2 549,7		-2 561,2	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets | countinuous predictors centered

Model 5-3A:

$$DISC_{tij} = \gamma_{000} + \gamma_{100}\, Year_{tij} + \gamma_{200}\, Year\_sqr_{tij} + \gamma_{300}\, FS\&M_{tij} + \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

Model 5-3B:

$$DISC_{tij} = \gamma_{000} + \gamma_{100}\, Year_{tij} + \gamma_{200}\, Year\_sqr_{tij} + \gamma_{300}\, FS\&M_{tij} + \gamma_{400}\, FList_{tij} + \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

Annex XII: Estimation results for Model 5-3C and Model 5-3D (step 3 intermediate models including control variables)

Number of observations 1 344		Dependent variable - Overall disclosure index (DISC)			
Number of groups:		Model 5-3C		Model 5-3D	
3rd level (countries) 14		Model 5-3B plus		Model 5-3B plus	
2nd level (firms) 168		control variables		control variables	
Number of occasions: 8 (1st level)		(Size | OwC)		(Size | OwC | ROA | Lev)	
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0162 ***	(0,0032)	0,0159 ***	(0,0032)
	Year_sqr	- 0,0016 ***	(0,0004)	- 0,0016 ***	(0,0004)
	FSales&Markets (FS&M)	- 0,0037	(0,0374)	- 0,0050	(0,0374)
	FListing (FList)	- 0,1096 ***	(0,0317)	- 0,1093 ***	(0,0317)
	Industry (Ind)	0,1956 ***	(0,0285)	0,1959 ***	(0,0285)
	Size	0,0015	(0,0059)	0,0015	(0,0059)
	Ownership concentration (OwC)	0,0482 ***	(0,0177)	0,0475 ***	(0,0177)
	Return on Assets (ROA)			- 0,0488	(0,0476)
	Leverage (Lev)			0,0000	(0,0006)
	Intercept	0,1494 ***	(0,0522)	0,1505 ***	(0,0522)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0308	(0,0126)	0,0307	(0,0126)
Firm level					
	Variance (_cons)	0,0291	(0,0035)	0,0291	(0,0035)
	Variance (Residual)	0,0050	(0,0002)	0,0050	(0,0002)
Log likelihood		1 306,1		1 306,6	
Deviance		-2 612,2		-2 613,2	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets | countinuous predictors centered

Model 5-3C:

$$DISC_{tij} = \gamma_{000} + \gamma_{100}\,Year_{tij} + \gamma_{200}\,Year\_sqr_{tij} + \gamma_{300}\,FS\&M_{tij} + \gamma_{400}\,FList_{tij} + \gamma_{500}\,Size_{tij} + \gamma_{600}\,OwC_{tij} + \\ + \gamma_{010}\,Ind_{ij} + \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

Model 5-3D:

$$DISC_{tij} = \gamma_{000}+\gamma_{100}Year_{tij}+\gamma_{200}Year\_sqr_{tij}+\gamma_{300}FS\&M_{tij}+\gamma_{400}FList_{tij}+\gamma_{500}Size_{tij}+\gamma_{600}OwC_{tij}+\gamma_{700}ROA_{tij}+\gamma_{800}Lev_{tij} + \\ + \gamma_{010}\,Ind_{ij} + \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

Annex XIII: Estimation results for Model 5-4A and Model 5-4B (step 4 intermediate models including control variables)

Number of observations 1 344		Dependent variable - Overall disclosure index (DISC)			
Number of groups:		Model 5-4A		Model 5-4B	
3rd level (countries | inst envir) 14 | 3		Model 5-4 plus		Model 5-4 with institutional	
2nd level (firms) 168		control variables CME | MME		environment as level-3 grouping	
Number of occasions: 8 (1st level)		Level-3 grouping variable: country		variable (instead of country)	
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0166 ***	(0,0031)	0,0166 ***	(0,0031)
	Year_sqr	- 0,0016 ***	(0,0004)	- 0,0016 ***	(0,0004)
	FSales&Markets (FS&M)	0,0086	(0,0363)	0,0093	(0,0366)
	MListing (MList)	- 0,0960 ***	(0,0304)	- 0,0997 ***	(0,0307)
	Industry (Ind)	0,1954 ***	(0,0275)	0,1980 ***	(0,0282)
	Mandatory_Guidance (Mand_Guid)	0,4957 ***	(0,0647)	0,5105 ***	(0,0484)
	Not_Mand_Detailed_Guidance (NMD_Guid)	0,3128 ***	(0,0585)	0,3223 ***	(0,0507)
	Not_Mand_Not_Detailed_Guidance (NMND_Guid)	0,1452 ***	(0,0423)	0,1457 ***	(0,0337)
	Coordinated Market Economies (CME)	0,0406	(0,0577)		
	Mixed Market Economies (MME)	0,1355 **	(0,0605)		
	Intercept	- 0,0229	(0,0482)	0,0334	(0,0383)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0013	(0,0014)	0,0026	(0,0029)
Firm level					
	Variance (_cons)	0,0286	(0,0034)	0,0306	(0,0035)
	Variance (Residual)	0,0051	(0,0002)	0,0051	(0,0002)
Log likelihood		1 317,8		1 312,8	
Deviance		-2 635,6		-2 625,5	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets | countinuous predictors centered

Model 5-4A:

$$DISC_{tij} = \gamma_{000} + \gamma_{100} Year_{tij} + \gamma_{200} Year\_sqr_{tij} + \gamma_{300} FS\&M_{tij} + \gamma_{400} FList_{tij} + \gamma_{010} Ind_{ij} + \\ + \gamma_{001} Mand\_Guid_{j} + \gamma_{002} NMD\_Guid_{j} + \gamma_{003} NMND\_Guid_{j} + \gamma_{004} CME_{j} + \gamma_{005} MME_{j} \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

Model 5-4B:

$$DISC_{tij} = \gamma_{000} + \gamma_{100} Year_{tij} + \gamma_{200} Year\_sqr_{tij} + \gamma_{300} FS\&M_{tij} + \gamma_{400} FList_{tij} + \gamma_{010} Ind_{ij} + \\ + \gamma_{001} Mand\_Guid_{j} + \gamma_{002} NMD\_Guid_{j} + \gamma_{003} NMND\_Guid_{j} + \\ + \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j}$$

Annex XIV: Estimation results for Model 5-6.1 and Model 5-6.2 (final models including control variables)

Number of observations 1 344		Dependent variable			
Number of groups:		Overall disclosure index (DISC)		IFRS disclosure index (DIFRS)	
3rd level (countries) 14		Model 5-6.1		Model 5-6.2	
2nd level (firms) 168		Model 5-5.1 plus		Model 5-6.1 with	
Number of occasions: 8 (1st level)		control variables		IFRSs disclosure index (DIFRS)	
		(Size | OwC | CME | MME)		as the dependent variable	
FIXED PART	Independent variables	Coef.	Std. Error	Coef.	Std. Error
	Year	0,0149 ***	(0,0031)	0,0176 ***	(0,0035)
	Year_sqr	- 0,0016 ***	(0,0004)	- 0,0019 ***	(0,0005)
	FSales&Markets (FS&M)	- 0,0282	(0,0550)	- 0,0651	(0,0606)
	MListing (MList)	- 0,0206	(0,0373)	0,0012	(0,0424)
	Industry (Ind)	0,1824 ***	(0,0306)	0,2058 ***	(0,0346)
	Mandatory_Guidance (Mand_Guid)	0,4750 ***	(0,0678)	0,5303 ***	(0,0750)
	Not_Mand_Detailed_Guidance (NMD_Guid)	0,3220 ***	(0,0613)	0,3298 ***	(0,0689)
	Not_Mand_Not_Detailed_Guidance (NMND_Guid)	0,1328 ***	(0,0430)	0,1968 ***	(0,0478)
	Year x Mand_Guid	0,0057 *	(0,0030)	0,0040	(0,0033)
	FSales&Markets x Mand_Guid	0,1459	(0,1663)	0,1969	(0,1835)
	Year x NMD_Guid	0,0072 **	(0,0030)	0,0053	(0,0034)
	FSales&Markets x NMD_Guid	0,4535 **	(0,1787)	0,5681 ***	(0,1978)
	Year x NMND_Guid	- 0,0007	(0,0019)	- 0,0047 **	(0,0021)
	FSales&Markets x NMND_Guid	0,2153	(0,1254)	- 0,0759	(0,1379)
	Size	0,0020	(0,0059)	0,0007	(0,0066)
	Ownership concentration (OwC)	0,0374 *	(0,0190)	0,0209	(0,0215)
	Coordinated Market Economies (CME)	0,0368	(0,0594)	0,0245	(0,0656)
	Mixed Market Economies (MME)	0,1478 **	(0,0603)	0,0953	(0,0660)
	Intercept	- 0,0420	(0,0477)	- 0,0172	(0,0526)
RANDOM PART		Estimate	Std. Error	Estimate	Std. Error
Country level					
	Variance (_cons)	0,0008	(0,0014)	0,0007	(0,0016)
Firm level (unstructured)					
	Variance (FSales&Markets)	0,1558	(0,0428)	0,1725	(0,0458)
	Variance (_cons)	0,0278	(0,0039)	0,0386	(0,0054)
	Covariance (FSales&Markets, _cons)	0,0173	(0,0106)	0,0300	(0,0137)
	Variance (Residual)	0,0044	(0,0002)	0,0056	(0,0002)
Log likelihood		1 364,2		1 202,6	
Deviance		-2 728,3		-2 405,2	

***significant at 1% level (2 tailed) | **significant at 5% level (2 tailed) | *significant at 10% level (2 tailed)

Std. errors reported in brackets | countinuous predictors centered

Model 5-6.1:

$$DISC_{tij} = \gamma_{000} + \gamma_{100}\,Year_{tij} + \gamma_{200}\,Year\_sqr_{tij} + \gamma_{300}\,FS\&M_{tij} + \gamma_{400}\,FList_{tij} + \gamma_{500}\,Size_{tij} + \gamma_{600}\,OwC_{tij} + \gamma_{010}\,Ind_{ij} +$$
$$+ \gamma_{001}\,Mand\_Guid_{j} + \gamma_{002}\,NMD\_Guid_{j} + \gamma_{003}\,NMND\_Guid_{j} + \gamma_{004}\,CME_{j} + \gamma_{005}\,MME_{j}$$
$$+ \gamma_{101}\,Year_{tij} \times Mand\_Guid_{j} + \gamma_{301}\,FS\&M_{tij} \times Mand\_Guid_{j} +$$
$$+ \gamma_{102}\,Year_{tij} \times NMD\_Guid_{j} + \gamma_{302}\,FS\&M_{tij} \times NMD\_Guid_{j} +$$
$$+ \gamma_{103}\,Year_{tij} \times NMND\_Guid_{j} + \gamma_{303}\,FS\&M_{tij} \times NMND\_Guid_{j} +$$
$$+ \varepsilon_{tij} + \mu_{0ij} + \upsilon_{00j} + \mu_{3ij}\,FS\&M_{tij}$$

Model 5-6.2: Model 5-6.1 with $DIFRS_{tij}$ (IFRS disclosure index) as the dependent variable

Annex XV: βij matrices describing the coefficients of comparability between groups

PANEL A: **Weighting all firms equal and assuming an overall international focus**

Coefficients βij	*Mandatory Guidance*	*Not_Mandatory Guidance*	*No_Guidance*
Mandatory Guidance	0,017	0,056	0,058
Not_Mandatory Guidance	0,056	0,184	0,189
No_Guidance	0,058	0,189	0,194

Coefficients βij	*Not_Mandatory Detailed*	*Not_Mandatory Not_Detailed*	*No_Guidance*
Not_Mandatory Detailed	0,012	0,042	0,056
Not_Mandatory Not_Detailed	0,042	0,147	0,194
No_Guidance	0,056	0,194	0,257

Coefficients βij	*Foreign Listed*	*Foreign Sales&Markets_AbAv*	*FS&M_BlAv*
Foreign Listed	0,024	0,055	0,055
Foreign Sales&Markets_AbAv	0,055	0,128	0,128
Foreign Sales&Markets_BlAv	0,055	0,128	0,128

PANEL B: **Weighting all industries equal and assuming a within international focus**

Coefficients βij	*Utilities*	*Oil&Gas*	*BMaterials*	*Industrials*	*Consumer G&S*	*Other*
Utilities	0,167	0,000	0,000	0,000	0,000	0,000
Oil&Gas	0,000	0,167	0,000	0,000	0,000	0,000
BMaterials	0,000	0,000	0,167	0,000	0,000	0,000
Industrials	0,000	0,000	0,000	0,167	0,000	0,000
Consumer G&S	0,000	0,000	0,000	0,000	0,167	0,000
Other	0,000	0,000	0,000	0,000	0,000	0,167

PANEL C: **Weighting all industries equal and assuming a between international focus**

Coefficients βij	*Utilities*	*Oil&Gas*	*BMaterials*	*Industrials*	*Consumer G&S*	*Other*
Utilities	0,000	0,033	0,033	0,033	0,033	0,033
Oil&Gas	0,033	0,000	0,033	0,033	0,033	0,033
BMaterials	0,033	0,033	0,000	0,033	0,033	0,033
Industrials	0,033	0,033	0,033	0,000	0,033	0,033
Consumer G&S	0,033	0,033	0,033	0,033	0,000	0,033
Other	0,033	0,033	0,033	0,033	0,033	0,000

PANEL D: **Weighting all industries equal and assuming an overall international focus**

Coefficients βij	*Utilities*	*Oil&Gas*	*BMaterials*	*Industrials*	*Consumer G&S*	*Other*
Utilities	0,028	0,028	0,028	0,028	0,028	0,028
Oil&Gas	0,028	0,028	0,028	0,028	0,028	0,028
BMaterials	0,028	0,028	0,028	0,028	0,028	0,028
Industrials	0,028	0,028	0,028	0,028	0,028	0,028
Consumer G&S	0,028	0,028	0,028	0,028	0,028	0,028
Other	0,028	0,028	0,028	0,028	0,028	0,028

Annex XVI: Possible disclosure methods for minimum comparable information on an aggregate approach

Method	Allowances	Emissions	Position
DM 1	ALL	ALL	ALL
DM 2	ALL	ALL	PhU
DM 3	ALL	ALL	CU
DM 4	ALL	ALL	ND
DM 5	ALL	PhU	ALL
DM 6	ALL	PhU	PhU
DM 7	ALL	PhU	CU
DM 8	ALL	PhU	ND
DM 9	ALL	CU	ALL
DM 10	ALL	CU	PhU
DM 11	ALL	CU	CU
DM 12	ALL	CU	ND
DM 13	ALL	ND	ALL
DM 14	ALL	ND	PhU
DM 15	ALL	ND	CU
DM 16	ALL	ND	ND
DM 17	PhU	ALL	ALL
DM 18	PhU	ALL	PhU
DM 19	PhU	ALL	CU
DM 20	PhU	ALL	ND
DM 21	PhU	PhU	ALL
DM 22	PhU	PhU	PhU
DM 23	PhU	PhU	CU
DM 24	PhU	PhU	ND
DM 25	PhU	CU	ALL
DM 26	PhU	CU	PhU
DM 27	PhU	CU	CU
DM 28	PhU	CU	ND
DM 29	PhU	ND	ALL
DM 30	PhU	ND	PhU
DM 31	PhU	ND	CU
DM 32	PhU	ND	ND

Method	Allowances	Emissions	Position
DM 33	CU	ALL	ALL
DM 34	CU	ALL	PhU
DM 35	CU	ALL	CU
DM 36	CU	ALL	ND
DM 37	CU	PhU	ALL
DM 38	CU	PhU	PhU
DM 39	CU	PhU	CU
DM 40	CU	PhU	ND
DM 41	CU	CU	ALL
DM 42	CU	CU	PhU
DM 43	CU	CU	CU
DM 44	CU	CU	ND
DM 45	CU	ND	ALL
DM 46	CU	ND	PhU
DM 47	CU	ND	CU
DM 48	CU	ND	ND
DM 49	ND	ALL	ALL
DM 50	ND	ALL	PhU
DM 51	ND	ALL	CU
DM 52	ND	ALL	ND
DM 53	ND	PhU	ALL
DM 54	ND	PhU	PhU
DM 55	ND	PhU	CU
DM 56	ND	PhU	ND
DM 57	ND	CU	ALL
DM 58	ND	CU	PhU
DM 59	ND	CU	CU
DM 60	ND	CU	ND
DM 61	ND	ND	ALL
DM 62	ND	ND	PhU
DM 63	ND	ND	CU
DM 64	ND	ND	ND

ND Not disclosed
PhU Disclosed only in physical units (CO2 tones)
CU Disclosed only in currency units
ALL Disclosed both in physical units and in currency units

Annex XVII: αkl,*MIM* matrix describing the comparability between disclosure methods (64 x 64)

akl	DM 1	DM 2	DM 3	DM 4	DM 5	DM 6	DM 7	DM 8	DM 9	DM 10	DM 11	DM 12	DM 13	DM 14	DM 15	DM 16	DM 17	DM 18	DM 19	DM 20	DM 21	DM 22
DM 1	1,000	0,833	0,833	0,667	0,833	0,667	0,667	0,500	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,833	0,667	0,667	0,500	0,667	0,500
DM 2	0,833	0,833	0,667	0,667	0,667	0,667	0,500	0,500	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,667	0,667	0,500	0,500	0,500	0,500
DM 3	0,833	0,667	0,833	0,667	0,667	0,500	0,667	0,500	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,667	0,500	0,667	0,500	0,500	0,333
DM 4	0,667	0,667	0,667	0,667	0,500	0,500	0,500	0,500	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,500	0,500	0,500	0,500	0,333	0,333
DM 5	0,833	0,667	0,667	0,500	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,667	0,500
DM 6	0,667	0,667	0,500	0,500	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,500	0,500
DM 7	0,667	0,500	0,667	0,500	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333
DM 8	0,500	0,500	0,500	0,500	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333
DM 9	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333
DM 10	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333
DM 11	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167
DM 12	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167
DM 13	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333
DM 14	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333
DM 15	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167
DM 16	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167
DM 17	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,833	0,667	0,667	0,500	0,667	0,500
DM 18	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,667	0,667	0,500	0,500	0,500	0,500
DM 19	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,667	0,500	0,667	0,500	0,500	0,333
DM 20	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,500	0,500	0,500	0,500	0,333	0,333
DM 21	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,667	0,500
DM 22	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,500	0,500
DM 23	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,500	0,333
DM 24	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,333	0,333
DM 25	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333
DM 26	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333
DM 27	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167
DM 28	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167
DM 29	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333
DM 30	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333
DM 31	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167
DM 32	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167
DM 33	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333
DM 34	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333
DM 35	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167
DM 36	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167
DM 37	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333
DM 38	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333
DM 39	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167
DM 40	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167
DM 41	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167
DM 42	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167
DM 43	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000
DM 44	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000
DM 45	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167
DM 46	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167
DM 47	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000
DM 48	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000
DM 49	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,667	0,500	0,500	0,333	0,500	0,333
DM 50	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,500	0,500	0,333	0,333	0,333	0,333
DM 51	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,500	0,333	0,500	0,333	0,333	0,167
DM 52	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,333	0,333	0,333	0,333	0,167	0,167
DM 53	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,500	0,333
DM 54	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,333	0,333
DM 55	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,333	0,167
DM 56	0,167	0,167	0,167	0,167	0,167	0,167	0,333	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,167	0,167
DM 57	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167
DM 58	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167
DM 59	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000
DM 60	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000
DM 61	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167
DM 62	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167
DM 63	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 64	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

Annex XVII: αkl,*MIM* matrix describing the comparability between disclosure methods (64 x 64)

akl	DM 23	DM 24	DM 25	DM 26	DM 27	DM 28	DM 29	DM 30	DM 31	DM 32	DM 33	DM 34	DM 35	DM 36	DM 37	DM 38	DM 39	DM 40	DM 41	DM 42	DM 43
DM 1	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,667	0,500	0,500
DM 2	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,500	0,500	0,333
DM 3	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,500	0,333	0,500
DM 4	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,333	0,333	0,333
DM 5	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333
DM 6	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167
DM 7	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333
DM 8	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167
DM 9	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500
DM 10	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333
DM 11	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500
DM 12	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333
DM 13	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333
DM 14	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167
DM 15	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333
DM 16	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167
DM 17	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333
DM 18	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167
DM 19	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333
DM 20	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167
DM 21	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167
DM 22	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000
DM 23	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167
DM 24	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000
DM 25	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333
DM 26	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167
DM 27	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333
DM 28	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167
DM 29	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167
DM 30	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000
DM 31	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167
DM 32	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 33	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,833	0,667	0,667	0,500	0,667	0,500	0,500	0,333	0,667	0,500	0,500
DM 34	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,667	0,667	0,500	0,500	0,500	0,500	0,333	0,333	0,500	0,500	0,333
DM 35	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,667	0,500	0,667	0,500	0,500	0,333	0,500	0,333	0,500	0,333	0,500
DM 36	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,500	0,500	0,500	0,500	0,333	0,333	0,333	0,333	0,333	0,333	0,333
DM 37	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,667	0,500	0,500	0,333	0,667	0,500	0,500	0,333	0,500	0,333	0,333
DM 38	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,500	0,500	0,333	0,333	0,500	0,500	0,333	0,333	0,333	0,333	0,167
DM 39	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,500	0,333	0,500	0,333	0,500	0,333	0,500	0,333	0,333	0,167	0,333
DM 40	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,333	0,167	0,167	0,167
DM 41	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500
DM 42	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333
DM 43	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500
DM 44	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333
DM 45	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333
DM 46	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167
DM 47	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333
DM 48	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167
DM 49	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333
DM 50	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167
DM 51	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333
DM 52	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167
DM 53	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167
DM 54	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000
DM 55	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167
DM 56	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000
DM 57	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333
DM 58	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167
DM 59	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,000
DM 60	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167
DM 61	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167
DM 62	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000
DM 63	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167
DM 64	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

Annex XVII: αkl,*MIM* matrix describing the comparability between disclosure methods (64 x 64)

akl	DM 44	DM 45	DM 46	DM 47	DM 48	DM 49	DM 50	DM 51	DM 52	DM 53	DM 54	DM 55	DM 56	DM 57	DM 58	DM 59	DM 60	DM 61	DM 62	DM 63	DM 64
DM 1	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 2	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 3	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000
DM 4	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 5	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 6	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 7	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 8	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 9	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 10	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 11	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000
DM 12	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 13	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 14	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 15	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 16	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 17	0,167	0,333	0,167	0,167	0,000	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 18	0,167	0,167	0,167	0,000	0,000	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 19	0,167	0,167	0,000	0,167	0,000	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000
DM 20	0,167	0,000	0,000	0,000	0,000	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 21	0,000	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 22	0,000	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 23	0,000	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 24	0,000	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 25	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 26	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 27	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000
DM 28	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 29	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 30	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 31	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 32	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 33	0,333	0,500	0,333	0,333	0,167	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 34	0,333	0,333	0,333	0,167	0,167	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 35	0,333	0,333	0,167	0,333	0,167	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000
DM 36	0,333	0,167	0,167	0,167	0,167	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 37	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 38	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 39	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 40	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 41	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 42	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 43	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,000	0,167	0,167	0,000	0,167	0,000
DM 44	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 45	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 46	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 47	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 48	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 49	0,167	0,333	0,167	0,167	0,000	0,667	0,500	0,500	0,333	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 50	0,167	0,167	0,167	0,000	0,000	0,500	0,500	0,333	0,333	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 51	0,167	0,167	0,000	0,167	0,000	0,500	0,333	0,500	0,333	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000
DM 52	0,167	0,000	0,000	0,000	0,000	0,333	0,333	0,333	0,333	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 53	0,000	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 54	0,000	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 55	0,000	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 56	0,000	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DM 57	0,167	0,333	0,167	0,167	0,000	0,500	0,333	0,333	0,167	0,333	0,167	0,167	0,000	0,333	0,333	0,333	0,167	0,333	0,167	0,167	0,000
DM 58	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000	0,333	0,333	0,167	0,167	0,167	0,167	0,000	0,000
DM 59	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000	0,333	0,167	0,333	0,167	0,167	0,000	0,167	0,000
DM 60	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000	0,167	0,167	0,167	0,167	0,000	0,000	0,000	0,000
DM 61	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000	0,333	0,167	0,167	0,000
DM 62	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000	0,167	0,167	0,000	0,000
DM 63	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000	0,167	0,000
DM 64	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

Annex XVIII: Relative frequencies of disclosure methods by type of guidance

2005	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,27	0,01	0,01	0,05
DM 3	0,05	0,00	0,00	0,01
DM 5	0,00	0,01	0,00	0,01
DM 9	0,00	0,00	0,00	0,00
DM 11	0,27	0,01	0,00	0,04
DM 12	0,00	0,00	0,00	0,00
DM 16	0,00	0,01	0,00	0,01
DM 18	0,05	0,00	0,00	0,01
DM 19	0,00	0,00	0,00	0,00
DM 21	0,00	0,03	0,01	0,02
DM 22	0,05	0,06	0,01	0,04
DM 23	0,00	0,01	0,01	0,01
DM 24	0,05	0,03	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,01	0,00	0,01
DM 30	0,00	0,01	0,00	0,01
DM 31	0,00	0,01	0,00	0,01
DM 32	0,09	0,04	0,03	0,04
DM 43	0,05	0,08	0,01	0,05
DM 47	0,00	0,00	0,00	0,00
DM 48	0,00	0,01	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,01	0,00	0,01
DM 60	0,00	0,00	0,01	0,01
DM 61	0,00	0,00	0,00	0,00
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,03	0,04	0,03
DM 64	0,14	0,58	0,82	0,63
TOTAL	1,00	1,00	1,00	1,00

2006	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,41	0,06	0,01	0,08
DM 3	0,05	0,00	0,00	0,01
DM 5	0,00	0,01	0,00	0,01
DM 9	0,00	0,00	0,00	0,00
DM 11	0,27	0,00	0,00	0,04
DM 12	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 18	0,05	0,00	0,00	0,01
DM 19	0,00	0,00	0,00	0,00
DM 21	0,00	0,04	0,01	0,02
DM 22	0,05	0,08	0,03	0,05
DM 23	0,00	0,01	0,00	0,01
DM 24	0,05	0,03	0,00	0,02
DM 27	0,00	0,01	0,00	0,01
DM 29	0,00	0,01	0,00	0,01
DM 30	0,00	0,00	0,00	0,00
DM 31	0,00	0,03	0,00	0,01
DM 32	0,05	0,06	0,03	0,04
DM 43	0,05	0,08	0,01	0,05
DM 47	0,05	0,00	0,00	0,01
DM 48	0,00	0,01	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,01	0,01
DM 59	0,00	0,01	0,00	0,01
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,03	0,04	0,03
DM 64	0,00	0,50	0,82	0,58
TOTAL	1,00	1,00	1,00	1,00

2007	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,41	0,06	0,01	0,08
DM 3	0,05	0,00	0,00	0,01
DM 5	0,00	0,01	0,00	0,01
DM 9	0,00	0,00	0,00	0,00
DM 11	0,27	0,00	0,00	0,04
DM 12	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 18	0,05	0,00	0,00	0,01
DM 19	0,00	0,00	0,00	0,00
DM 21	0,00	0,04	0,01	0,02
DM 22	0,00	0,08	0,03	0,05
DM 23	0,00	0,01	0,00	0,01
DM 24	0,05	0,03	0,00	0,02
DM 27	0,00	0,01	0,00	0,01
DM 29	0,05	0,01	0,00	0,01
DM 30	0,00	0,01	0,00	0,01
DM 31	0,00	0,01	0,00	0,01
DM 32	0,00	0,04	0,03	0,03
DM 43	0,05	0,08	0,01	0,05
DM 47	0,05	0,00	0,00	0,01
DM 48	0,00	0,03	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,01	0,01	0,01
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,01	0,01
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,01	0,03	0,02
DM 64	0,05	0,51	0,82	0,59
TOTAL	1,00	1,00	1,00	1,00

2008	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,41	0,04	0,00	0,07
DM 3	0,05	0,00	0,00	0,01
DM 5	0,00	0,00	0,00	0,00
DM 9	0,05	0,00	0,00	0,01
DM 11	0,23	0,00	0,00	0,03
DM 12	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 18	0,05	0,00	0,00	0,01
DM 19	0,05	0,00	0,00	0,01
DM 21	0,00	0,06	0,03	0,04
DM 22	0,05	0,07	0,05	0,06
DM 23	0,00	0,01	0,00	0,01
DM 24	0,00	0,04	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,01	0,00	0,01
DM 30	0,00	0,01	0,00	0,01
DM 31	0,00	0,01	0,00	0,01
DM 32	0,00	0,04	0,00	0,02
DM 43	0,05	0,11	0,01	0,06
DM 47	0,05	0,00	0,00	0,01
DM 48	0,00	0,01	0,00	0,01
DM 56	0,00	0,00	0,04	0,02
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,01	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,01	0,00	0,01
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,03	0,01	0,02
DM 64	0,05	0,50	0,82	0,58
TOTAL	1,00	1,00	1,00	1,00

Annex XVIII: Relative frequencies of disclosure methods by type of guidance

2009	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,45	0,04	0,00	0,08
DM 3	0,09	0,00	0,00	0,01
DM 5	0,00	0,00	0,00	0,00
DM 9	0,05	0,00	0,00	0,01
DM 11	0,14	0,00	0,00	0,02
DM 12	0,05	0,00	0,00	0,01
DM 16	0,00	0,00	0,00	0,00
DM 18	0,00	0,00	0,00	0,00
DM 19	0,05	0,00	0,00	0,01
DM 21	0,00	0,06	0,04	0,04
DM 22	0,05	0,08	0,05	0,07
DM 23	0,00	0,01	0,00	0,01
DM 24	0,00	0,04	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,01	0,00	0,01
DM 30	0,00	0,01	0,00	0,01
DM 31	0,00	0,01	0,00	0,01
DM 32	0,05	0,03	0,00	0,02
DM 43	0,05	0,11	0,01	0,06
DM 47	0,00	0,00	0,00	0,00
DM 48	0,00	0,01	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,01	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,03	0,04	0,03
DM 64	0,05	0,51	0,80	0,58
TOTAL	1,00	1,00	1,00	1,00

2010	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,45	0,04	0,00	0,08
DM 3	0,09	0,00	0,00	0,01
DM 5	0,00	0,00	0,00	0,00
DM 9	0,05	0,00	0,00	0,01
DM 11	0,14	0,00	0,00	0,02
DM 12	0,05	0,00	0,00	0,01
DM 16	0,00	0,00	0,00	0,00
DM 18	0,00	0,00	0,00	0,00
DM 19	0,05	0,00	0,00	0,01
DM 21	0,00	0,06	0,04	0,04
DM 22	0,05	0,08	0,05	0,07
DM 23	0,00	0,01	0,00	0,01
DM 24	0,00	0,04	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,01	0,00	0,01
DM 30	0,00	0,01	0,00	0,01
DM 31	0,00	0,01	0,00	0,01
DM 32	0,05	0,04	0,00	0,02
DM 43	0,05	0,11	0,01	0,06
DM 47	0,00	0,00	0,00	0,00
DM 48	0,00	0,01	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,01	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,03	0,01	0,02
DM 64	0,05	0,50	0,82	0,58
TOTAL	1,00	1,00	1,00	1,00

2011	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,45	0,04	0,00	0,08
DM 3	0,09	0,00	0,00	0,01
DM 5	0,00	0,00	0,00	0,00
DM 9	0,05	0,00	0,00	0,01
DM 11	0,14	0,00	0,00	0,02
DM 12	0,05	0,00	0,00	0,01
DM 16	0,00	0,00	0,00	0,00
DM 18	0,00	0,00	0,00	0,00
DM 19	0,05	0,00	0,00	0,01
DM 21	0,00	0,06	0,04	0,04
DM 22	0,05	0,08	0,05	0,07
DM 23	0,00	0,01	0,00	0,01
DM 24	0,00	0,04	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,01	0,00	0,01
DM 30	0,00	0,01	0,00	0,01
DM 31	0,00	0,01	0,00	0,01
DM 32	0,05	0,04	0,00	0,02
DM 43	0,05	0,11	0,01	0,06
DM 47	0,00	0,00	0,00	0,00
DM 48	0,00	0,01	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,01	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,03	0,01	0,02
DM 64	0,05	0,50	0,82	0,58
TOTAL	1,00	1,00	1,00	1,00

2012	*Mand Guid*	*Not Mand Guid*	*No Guid*	*ALL*
DM 1	0,45	0,04	0,00	0,08
DM 3	0,09	0,00	0,00	0,01
DM 5	0,00	0,00	0,00	0,00
DM 9	0,05	0,00	0,00	0,01
DM 11	0,14	0,00	0,00	0,02
DM 12	0,05	0,00	0,00	0,01
DM 16	0,00	0,00	0,00	0,00
DM 18	0,00	0,00	0,00	0,00
DM 19	0,05	0,00	0,00	0,01
DM 21	0,00	0,06	0,04	0,04
DM 22	0,05	0,08	0,05	0,07
DM 23	0,00	0,01	0,00	0,01
DM 24	0,00	0,04	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,01	0,00	0,01
DM 30	0,00	0,01	0,00	0,01
DM 31	0,00	0,01	0,00	0,01
DM 32	0,05	0,04	0,00	0,02
DM 43	0,05	0,11	0,01	0,06
DM 47	0,00	0,00	0,00	0,00
DM 48	0,00	0,01	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,01	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,00	0,01	0,00	0,01
DM 63	0,00	0,03	0,01	0,02
DM 64	0,05	0,50	0,82	0,58
TOTAL	1,00	1,00	1,00	1,00

Annex XIX: Relative frequencies of disclosure methods by type of guidance, adjusted to control for industry effects

2005	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,27	0,02	0,02
DM 3	0,05	0,00	0,00
DM 5	0,00	0,02	0,00
DM 9	0,00	0,00	0,00
DM 11	0,27	0,02	0,00
DM 12	0,00	0,00	0,00
DM 16	0,00	0,01	0,00
DM 18	0,05	0,00	0,00
DM 19	0,00	0,00	0,00
DM 21	0,00	0,02	0,01
DM 22	0,05	0,06	0,03
DM 23	0,00	0,02	0,01
DM 24	0,05	0,03	0,00
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,02	0,00
DM 31	0,00	0,02	0,00
DM 32	0,09	0,05	0,04
DM 43	0,05	0,09	0,03
DM 47	0,00	0,00	0,00
DM 48	0,00	0,02	0,00
DM 56	0,00	0,00	0,03
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,00
DM 60	0,00	0,00	0,01
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,00	0,03	0,07
DM 64	0,14	0,53	0,75
TOTAL	1,00	1,00	1,00

2006	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,41	0,05	0,02
DM 3	0,05	0,00	0,00
DM 5	0,00	0,02	0,00
DM 9	0,00	0,00	0,00
DM 11	0,27	0,00	0,00
DM 12	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 18	0,05	0,00	0,00
DM 19	0,00	0,00	0,00
DM 21	0,00	0,04	0,01
DM 22	0,05	0,09	0,06
DM 23	0,00	0,02	0,00
DM 24	0,05	0,03	0,00
DM 27	0,00	0,02	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,00	0,00
DM 31	0,00	0,02	0,00
DM 32	0,05	0,06	0,02
DM 43	0,05	0,09	0,03
DM 47	0,05	0,00	0,00
DM 48	0,00	0,02	0,00
DM 56	0,00	0,00	0,03
DM 57	0,00	0,00	0,01
DM 59	0,00	0,02	0,00
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,00	0,03	0,07
DM 64	0,00	0,45	0,75
TOTAL	1,00	1,00	1,00

2007	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,41	0,05	0,02
DM 3	0,05	0,00	0,00
DM 5	0,00	0,02	0,00
DM 9	0,00	0,00	0,00
DM 11	0,27	0,00	0,00
DM 12	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 18	0,05	0,00	0,00
DM 19	0,00	0,00	0,00
DM 21	0,00	0,04	0,01
DM 22	0,00	0,09	0,04
DM 23	0,00	0,02	0,00
DM 24	0,05	0,03	0,00
DM 27	0,00	0,02	0,00
DM 29	0,05	0,02	0,00
DM 30	0,00	0,02	0,00
DM 31	0,00	0,01	0,00
DM 32	0,00	0,05	0,04
DM 43	0,05	0,09	0,03
DM 47	0,05	0,00	0,00
DM 48	0,00	0,03	0,00
DM 56	0,00	0,00	0,03
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,01
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,02
DM 62	0,00	0,02	0,00
DM 63	0,00	0,01	0,06
DM 64	0,05	0,46	0,74
TOTAL	1,00	1,00	1,00

2008	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,41	0,04	0,00
DM 3	0,05	0,00	0,00
DM 5	0,00	0,00	0,00
DM 9	0,05	0,00	0,00
DM 11	0,23	0,00	0,00
DM 12	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 18	0,05	0,00	0,00
DM 19	0,05	0,00	0,00
DM 21	0,00	0,06	0,02
DM 22	0,05	0,08	0,09
DM 23	0,00	0,02	0,00
DM 24	0,00	0,05	0,00
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,02	0,00
DM 31	0,00	0,01	0,00
DM 32	0,00	0,05	0,00
DM 43	0,05	0,12	0,03
DM 47	0,05	0,00	0,00
DM 48	0,00	0,02	0,00
DM 56	0,00	0,00	0,04
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,04
DM 60	0,00	0,00	0,00
DM 61	0,00	0,02	0,00
DM 62	0,00	0,02	0,00
DM 63	0,00	0,03	0,03
DM 64	0,05	0,45	0,75
TOTAL	1,00	1,00	1,00

Annex XIX: Relative frequencies of disclosure methods by type of guidance, adjusted to control for industry effects

2009	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,45	0,04	0,00
DM 3	0,09	0,00	0,00
DM 5	0,00	0,00	0,00
DM 9	0,05	0,00	0,00
DM 11	0,14	0,00	0,00
DM 12	0,05	0,00	0,00
DM 16	0,00	0,00	0,00
DM 18	0,00	0,00	0,00
DM 19	0,05	0,00	0,00
DM 21	0,00	0,06	0,05
DM 22	0,05	0,10	0,07
DM 23	0,00	0,02	0,00
DM 24	0,00	0,05	0,00
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,02	0,00
DM 31	0,00	0,01	0,00
DM 32	0,05	0,04	0,00
DM 43	0,05	0,12	0,03
DM 47	0,00	0,00	0,00
DM 48	0,00	0,02	0,00
DM 56	0,00	0,00	0,03
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,04
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,00	0,03	0,05
DM 64	0,05	0,46	0,72
TOTAL	1,00	1,00	1,00

2010	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,45	0,04	0,00
DM 3	0,09	0,00	0,00
DM 5	0,00	0,00	0,00
DM 9	0,05	0,00	0,00
DM 11	0,14	0,00	0,00
DM 12	0,05	0,00	0,00
DM 16	0,00	0,00	0,00
DM 18	0,00	0,00	0,00
DM 19	0,05	0,00	0,00
DM 21	0,00	0,06	0,05
DM 22	0,05	0,10	0,07
DM 23	0,00	0,02	0,00
DM 24	0,00	0,05	0,00
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,02	0,00
DM 31	0,00	0,01	0,00
DM 32	0,05	0,04	0,00
DM 43	0,05	0,12	0,03
DM 47	0,00	0,00	0,00
DM 48	0,00	0,02	0,00
DM 56	0,00	0,00	0,03
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,04
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,00	0,03	0,03
DM 64	0,05	0,45	0,75
TOTAL	1,00	1,00	1,00

2011	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,45	0,04	0,00
DM 3	0,09	0,00	0,00
DM 5	0,00	0,00	0,00
DM 9	0,05	0,00	0,00
DM 11	0,14	0,00	0,00
DM 12	0,05	0,00	0,00
DM 16	0,00	0,00	0,00
DM 18	0,00	0,00	0,00
DM 19	0,05	0,00	0,00
DM 21	0,00	0,06	0,05
DM 22	0,05	0,10	0,07
DM 23	0,00	0,02	0,00
DM 24	0,00	0,05	0,00
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,02	0,00
DM 31	0,00	0,01	0,00
DM 32	0,05	0,04	0,00
DM 43	0,05	0,12	0,03
DM 47	0,00	0,00	0,00
DM 48	0,00	0,02	0,00
DM 56	0,00	0,00	0,03
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,04
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,00	0,03	0,03
DM 64	0,05	0,45	0,75
TOTAL	1,00	1,00	1,00

2012	*Mand*	*Not Mand adj*	*No Guid adj*
DM 1	0,45	0,04	0,00
DM 3	0,09	0,00	0,00
DM 5	0,00	0,00	0,00
DM 9	0,05	0,00	0,00
DM 11	0,14	0,00	0,00
DM 12	0,05	0,00	0,00
DM 16	0,00	0,00	0,00
DM 18	0,00	0,00	0,00
DM 19	0,05	0,00	0,00
DM 21	0,00	0,06	0,05
DM 22	0,05	0,10	0,07
DM 23	0,00	0,02	0,00
DM 24	0,00	0,05	0,00
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,02	0,00
DM 31	0,00	0,01	0,00
DM 32	0,05	0,04	0,00
DM 43	0,05	0,12	0,03
DM 47	0,00	0,00	0,00
DM 48	0,00	0,02	0,00
DM 56	0,00	0,00	0,03
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,04
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,00	0,03	0,03
DM 64	0,05	0,45	0,75
TOTAL	1,00	1,00	1,00

Annex XX: Relative frequencies of disclosure methods by detail of guidance on items to be reported in the annex

2005	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,00	0,02	0,01	0,01
DM 5	0,00	0,02	0,00	0,01
DM 11	0,00	0,02	0,00	0,01
DM 16	0,00	0,02	0,00	0,01
DM 21	0,06	0,02	0,01	0,02
DM 22	0,13	0,04	0,01	0,03
DM 23	0,06	0,00	0,01	0,01
DM 24	0,06	0,02	0,00	0,01
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,02	0,00	0,01
DM 31	0,00	0,02	0,00	0,01
DM 32	0,13	0,02	0,03	0,03
DM 43	0,19	0,05	0,01	0,05
DM 48	0,00	0,02	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,02	0,00	0,01
DM 60	0,00	0,00	0,01	0,01
DM 61	0,00	0,00	0,00	0,00
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,04	0,04	0,03
DM 64	0,31	0,66	0,82	0,71
TOTAL	1,00	1,00	1,00	1,00

2006	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,19	0,02	0,01	0,03
DM 5	0,00	0,02	0,00	0,01
DM 11	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 21	0,06	0,04	0,01	0,03
DM 22	0,13	0,07	0,03	0,05
DM 23	0,06	0,00	0,00	0,01
DM 24	0,06	0,02	0,00	0,01
DM 27	0,00	0,02	0,00	0,01
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,00	0,00	0,00
DM 31	0,00	0,04	0,00	0,01
DM 32	0,13	0,04	0,03	0,04
DM 43	0,19	0,05	0,01	0,05
DM 48	0,00	0,02	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,01	0,01
DM 59	0,00	0,02	0,00	0,01
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,04	0,04	0,03
DM 64	0,13	0,61	0,82	0,66
TOTAL	1,00	1,00	1,00	1,00

2007	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,19	0,02	0,01	0,03
DM 5	0,00	0,02	0,00	0,01
DM 11	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 21	0,06	0,04	0,01	0,03
DM 22	0,13	0,07	0,03	0,05
DM 23	0,06	0,00	0,00	0,01
DM 24	0,06	0,02	0,00	0,01
DM 27	0,00	0,02	0,00	0,01
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,02	0,00	0,01
DM 31	0,00	0,02	0,00	0,01
DM 32	0,06	0,04	0,03	0,03
DM 43	0,19	0,05	0,01	0,05
DM 48	0,00	0,04	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,02	0,01	0,01
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,01	0,01
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,02	0,03	0,02
DM 64	0,19	0,61	0,82	0,67
TOTAL	1,00	1,00	1,00	1,00

2008	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,13	0,02	0,00	0,02
DM 5	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 21	0,06	0,05	0,03	0,04
DM 22	0,13	0,05	0,05	0,06
DM 23	0,06	0,00	0,00	0,01
DM 24	0,13	0,02	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,02	0,00	0,01
DM 31	0,00	0,02	0,00	0,01
DM 32	0,06	0,04	0,00	0,02
DM 43	0,25	0,07	0,01	0,06
DM 48	0,00	0,02	0,00	0,01
DM 56	0,00	0,00	0,04	0,02
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,02	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,02	0,00	0,01
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,04	0,01	0,02
DM 64	0,13	0,61	0,82	0,66
TOTAL	1,00	1,00	1,00	1,00

Annex XX: Relative frequencies of disclosure methods by detail of guidance on items to be reported in the annex

2009	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,13	0,02	0,00	0,02
DM 5	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 21	0,06	0,05	0,04	0,05
DM 22	0,13	0,07	0,05	0,07
DM 23	0,06	0,00	0,00	0,01
DM 24	0,13	0,02	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,02	0,00	0,01
DM 31	0,00	0,02	0,00	0,01
DM 32	0,06	0,02	0,00	0,01
DM 43	0,25	0,07	0,01	0,06
DM 48	0,00	0,02	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,02	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,04	0,04	0,03
DM 64	0,13	0,63	0,80	0,66
TOTAL	1,00	1,00	1,00	1,00

2010	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,13	0,02	0,00	0,02
DM 5	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 21	0,06	0,05	0,04	0,05
DM 22	0,13	0,07	0,05	0,07
DM 23	0,06	0,00	0,00	0,01
DM 24	0,13	0,02	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,02	0,00	0,01
DM 31	0,00	0,02	0,00	0,01
DM 32	0,06	0,04	0,00	0,02
DM 43	0,25	0,07	0,01	0,06
DM 48	0,00	0,02	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,02	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,04	0,01	0,02
DM 64	0,13	0,61	0,82	0,66
TOTAL	1,00	1,00	1,00	1,00

2011	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,13	0,02	0,00	0,02
DM 5	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 21	0,06	0,05	0,04	0,05
DM 22	0,13	0,07	0,05	0,07
DM 23	0,06	0,00	0,00	0,01
DM 24	0,13	0,02	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,02	0,00	0,01
DM 31	0,00	0,02	0,00	0,01
DM 32	0,06	0,04	0,00	0,02
DM 43	0,25	0,07	0,01	0,06
DM 48	0,00	0,02	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,02	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,04	0,01	0,02
DM 64	0,13	0,61	0,82	0,66
TOTAL	1,00	1,00	1,00	1,00

2012	*NM Detail*	*NM Not Detail*	*No Guid*	*ALL*
DM 1	0,13	0,02	0,00	0,02
DM 5	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00
DM 21	0,06	0,05	0,04	0,05
DM 22	0,13	0,07	0,05	0,07
DM 23	0,06	0,00	0,00	0,01
DM 24	0,13	0,02	0,00	0,02
DM 27	0,00	0,00	0,00	0,00
DM 29	0,00	0,02	0,00	0,01
DM 30	0,00	0,02	0,00	0,01
DM 31	0,00	0,02	0,00	0,01
DM 32	0,06	0,04	0,00	0,02
DM 43	0,25	0,07	0,01	0,06
DM 48	0,00	0,02	0,00	0,01
DM 56	0,00	0,00	0,03	0,01
DM 57	0,00	0,00	0,00	0,00
DM 59	0,00	0,02	0,03	0,02
DM 60	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00
DM 62	0,06	0,00	0,00	0,01
DM 63	0,00	0,04	0,01	0,02
DM 64	0,13	0,61	0,82	0,66
TOTAL	1,00	1,00	1,00	1,00

Annex XXI: Relative frequencies of disclosure methods by industry

2005	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,00	0,00	0,00	0,05	0,00	0,00
DM 5	0,00	0,00	0,00	0,03	0,00	0,00
DM 11	0,00	0,07	0,00	0,00	0,00	0,00
DM 16	0,06	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,00	0,00	0,03	0,00	0,00
DM 22	0,06	0,07	0,07	0,03	0,00	0,00
DM 23	0,06	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,00	0,03	0,00
DM 27	0,00	0,00	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,03	0,00	0,00
DM 31	0,00	0,07	0,00	0,00	0,00	0,00
DM 32	0,00	0,07	0,07	0,05	0,00	0,00
DM 43	0,11	0,00	0,13	0,03	0,00	0,00
DM 48	0,00	0,00	0,03	0,00	0,00	0,00
DM 56	0,00	0,00	0,03	0,00	0,00	0,10
DM 57	0,00	0,00	0,00	0,00	0,00	0,00
DM 59	0,00	0,00	0,03	0,00	0,00	0,00
DM 60	0,06	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,06	0,14	0,07	0,00	0,00	0,00
DM 64	0,50	0,50	0,50	0,74	0,97	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

2006	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,06	0,00	0,03	0,05	0,03	0,00
DM 5	0,00	0,00	0,00	0,03	0,00	0,00
DM 11	0,00	0,00	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,07	0,00	0,03	0,00	0,00
DM 22	0,11	0,07	0,13	0,03	0,00	0,00
DM 23	0,00	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,00	0,03	0,00
DM 27	0,00	0,07	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,00	0,00	0,00
DM 31	0,06	0,00	0,00	0,03	0,00	0,00
DM 32	0,06	0,07	0,03	0,05	0,03	0,00
DM 43	0,11	0,00	0,13	0,03	0,00	0,00
DM 48	0,00	0,00	0,00	0,03	0,00	0,00
DM 56	0,00	0,00	0,03	0,00	0,00	0,10
DM 57	0,06	0,00	0,00	0,00	0,00	0,00
DM 59	0,00	0,00	0,03	0,00	0,00	0,00
DM 60	0,00	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,06	0,14	0,07	0,00	0,00	0,00
DM 64	0,39	0,50	0,47	0,72	0,91	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

2007	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,06	0,00	0,03	0,05	0,03	0,00
DM 5	0,00	0,00	0,00	0,03	0,00	0,00
DM 11	0,00	0,00	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,07	0,00	0,03	0,00	0,00
DM 22	0,11	0,14	0,10	0,03	0,00	0,00
DM 23	0,00	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,00	0,03	0,00
DM 27	0,00	0,07	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,03	0,00	0,00
DM 31	0,06	0,00	0,00	0,00	0,00	0,00
DM 32	0,06	0,00	0,07	0,05	0,00	0,00
DM 43	0,11	0,00	0,13	0,03	0,00	0,00
DM 48	0,00	0,07	0,00	0,03	0,00	0,00
DM 56	0,00	0,00	0,03	0,00	0,00	0,10
DM 57	0,00	0,00	0,00	0,00	0,00	0,00
DM 59	0,06	0,00	0,03	0,00	0,00	0,00
DM 60	0,00	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,03	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,06	0,00	0,07	0,00	0,00	0,00
DM 64	0,39	0,57	0,47	0,69	0,94	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

2008	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,06	0,00	0,03	0,00	0,03	0,00
DM 5	0,00	0,00	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,14	0,00	0,05	0,00	0,00
DM 22	0,06	0,14	0,13	0,05	0,00	0,00
DM 23	0,00	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,03	0,03	0,00
DM 27	0,00	0,00	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,03	0,00	0,00
DM 31	0,06	0,00	0,00	0,00	0,00	0,00
DM 32	0,00	0,00	0,03	0,05	0,00	0,00
DM 43	0,11	0,00	0,13	0,05	0,03	0,00
DM 48	0,00	0,00	0,00	0,03	0,00	0,00
DM 56	0,06	0,00	0,03	0,00	0,00	0,10
DM 57	0,00	0,00	0,00	0,00	0,00	0,00
DM 59	0,06	0,00	0,07	0,00	0,00	0,00
DM 60	0,00	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,07	0,00	0,00	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,06	0,07	0,03	0,00	0,00	0,00
DM 64	0,44	0,50	0,47	0,69	0,91	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

Annex XXI: Relative frequencies of disclosure methods by industry

2009	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,06	0,00	0,03	0,00	0,03	0,00
DM 5	0,00	0,00	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,14	0,03	0,05	0,00	0,00
DM 22	0,11	0,21	0,10	0,05	0,00	0,00
DM 23	0,00	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,03	0,03	0,00
DM 27	0,00	0,00	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,03	0,00	0,00
DM 31	0,06	0,00	0,00	0,00	0,00	0,00
DM 32	0,00	0,00	0,03	0,03	0,00	0,00
DM 43	0,11	0,00	0,13	0,05	0,03	0,00
DM 48	0,00	0,00	0,00	0,03	0,00	0,00
DM 56	0,00	0,00	0,03	0,00	0,00	0,10
DM 57	0,00	0,00	0,00	0,00	0,00	0,00
DM 59	0,06	0,00	0,07	0,00	0,00	0,00
DM 60	0,00	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,17	0,07	0,03	0,00	0,00	0,00
DM 64	0,33	0,50	0,47	0,72	0,91	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

2010	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,06	0,00	0,03	0,00	0,03	0,00
DM 5	0,00	0,00	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,14	0,03	0,05	0,00	0,00
DM 22	0,11	0,21	0,10	0,05	0,00	0,00
DM 23	0,00	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,03	0,03	0,00
DM 27	0,00	0,00	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,03	0,00	0,00
DM 31	0,06	0,00	0,00	0,00	0,00	0,00
DM 32	0,06	0,00	0,03	0,03	0,00	0,00
DM 43	0,11	0,00	0,13	0,05	0,03	0,00
DM 48	0,00	0,00	0,00	0,03	0,00	0,00
DM 56	0,00	0,00	0,03	0,00	0,00	0,10
DM 57	0,00	0,00	0,00	0,00	0,00	0,00
DM 59	0,06	0,00	0,07	0,00	0,00	0,00
DM 60	0,00	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,06	0,07	0,03	0,00	0,00	0,00
DM 64	0,39	0,50	0,47	0,72	0,91	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

2011	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,06	0,00	0,03	0,00	0,03	0,00
DM 5	0,00	0,00	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,14	0,03	0,05	0,00	0,00
DM 22	0,11	0,21	0,10	0,05	0,00	0,00
DM 23	0,00	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,03	0,03	0,00
DM 27	0,00	0,00	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,03	0,00	0,00
DM 31	0,06	0,00	0,00	0,00	0,00	0,00
DM 32	0,06	0,00	0,03	0,03	0,00	0,00
DM 43	0,11	0,00	0,13	0,05	0,03	0,00
DM 48	0,00	0,00	0,00	0,03	0,00	0,00
DM 56	0,00	0,00	0,03	0,00	0,00	0,10
DM 57	0,00	0,00	0,00	0,00	0,00	0,00
DM 59	0,06	0,00	0,07	0,00	0,00	0,00
DM 60	0,00	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,06	0,07	0,03	0,00	0,00	0,00
DM 64	0,39	0,50	0,47	0,72	0,91	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

2012	*Utilities*	*O&G*	*BMat*	*Indust*	*Cons*	*Other*
DM 1	0,06	0,00	0,03	0,00	0,03	0,00
DM 5	0,00	0,00	0,00	0,00	0,00	0,00
DM 11	0,00	0,00	0,00	0,00	0,00	0,00
DM 16	0,00	0,00	0,00	0,00	0,00	0,00
DM 21	0,11	0,14	0,03	0,05	0,00	0,00
DM 22	0,11	0,21	0,10	0,05	0,00	0,00
DM 23	0,00	0,07	0,00	0,00	0,00	0,00
DM 24	0,00	0,00	0,03	0,03	0,03	0,00
DM 27	0,00	0,00	0,00	0,00	0,00	0,00
DM 29	0,00	0,00	0,00	0,03	0,00	0,00
DM 30	0,00	0,00	0,00	0,03	0,00	0,00
DM 31	0,06	0,00	0,00	0,00	0,00	0,00
DM 32	0,06	0,00	0,03	0,03	0,00	0,00
DM 43	0,11	0,00	0,13	0,05	0,03	0,00
DM 48	0,00	0,00	0,00	0,03	0,00	0,00
DM 56	0,00	0,00	0,03	0,00	0,00	0,10
DM 57	0,00	0,00	0,00	0,00	0,00	0,00
DM 59	0,06	0,00	0,07	0,00	0,00	0,00
DM 60	0,00	0,00	0,00	0,00	0,00	0,00
DM 61	0,00	0,00	0,00	0,00	0,00	0,00
DM 62	0,00	0,00	0,03	0,00	0,00	0,00
DM 63	0,06	0,07	0,03	0,00	0,00	0,00
DM 64	0,39	0,50	0,47	0,72	0,91	0,90
TOTAL	1,00	1,00	1,00	1,00	1,00	1,00

Annex XXII: Relative frequencies of disclosure methods by listing status and internationalization through sales

2005	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,04	0,02	0,00
DM 5	0,04	0,00	0,00
DM 11	0,00	0,00	0,02
DM 16	0,00	0,00	0,02
DM 21	0,00	0,02	0,03
DM 22	0,00	0,05	0,03
DM 23	0,00	0,00	0,03
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,00	0,00	0,02
DM 31	0,00	0,02	0,00
DM 32	0,00	0,05	0,03
DM 43	0,04	0,07	0,03
DM 48	0,04	0,00	0,00
DM 56	0,00	0,03	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,00
DM 60	0,00	0,00	0,02
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,04	0,00	0,07
DM 64	0,81	0,68	0,68
TOTAL	1,00	1,00	1,00

2006	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,00	0,05	0,03
DM 5	0,04	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,03	0,03
DM 22	0,04	0,05	0,07
DM 23	0,00	0,00	0,02
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,02
DM 29	0,00	0,02	0,00
DM 30	0,00	0,00	0,00
DM 31	0,00	0,00	0,03
DM 32	0,00	0,03	0,07
DM 43	0,04	0,07	0,03
DM 48	0,04	0,00	0,00
DM 56	0,00	0,03	0,00
DM 57	0,00	0,00	0,02
DM 59	0,00	0,02	0,00
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,04	0,00	0,07
DM 64	0,81	0,67	0,60
TOTAL	1,00	1,00	1,00

2007	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,00	0,05	0,03
DM 5	0,04	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,03	0,03
DM 22	0,04	0,07	0,05
DM 23	0,00	0,00	0,02
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,02
DM 29	0,00	0,02	0,00
DM 30	0,00	0,00	0,02
DM 31	0,00	0,00	0,02
DM 32	0,00	0,02	0,07
DM 43	0,04	0,07	0,03
DM 48	0,08	0,00	0,00
DM 56	0,00	0,03	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,02
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,02
DM 62	0,00	0,02	0,00
DM 63	0,00	0,00	0,05
DM 64	0,81	0,67	0,62
TOTAL	1,00	1,00	1,00

2008	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,00	0,02	0,03
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,03	0,07
DM 22	0,00	0,08	0,07
DM 23	0,00	0,00	0,02
DM 24	0,00	0,03	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,02
DM 32	0,00	0,02	0,03
DM 43	0,04	0,08	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,03	0,02
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,03
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,02
DM 62	0,00	0,02	0,00
DM 63	0,04	0,00	0,03
DM 64	0,85	0,65	0,60
TOTAL	1,00	1,00	1,00

Annex XXII: Relative frequencies of disclosure methods by listing status and internationalization through sales

2009	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,00	0,02	0,03
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,03	0,08
DM 22	0,00	0,08	0,08
DM 23	0,00	0,00	0,02
DM 24	0,00	0,03	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,02
DM 32	0,00	0,00	0,03
DM 43	0,04	0,08	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,03	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,03
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,04	0,00	0,07
DM 64	0,85	0,67	0,57
TOTAL	1,00	1,00	1,00

2010	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,00	0,02	0,03
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,03	0,08
DM 22	0,00	0,08	0,08
DM 23	0,00	0,00	0,02
DM 24	0,00	0,03	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,02
DM 32	0,00	0,00	0,05
DM 43	0,04	0,08	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,03	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,03
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,04	0,00	0,03
DM 64	0,85	0,67	0,58
TOTAL	1,00	1,00	1,00

2011	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,00	0,02	0,03
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,03	0,08
DM 22	0,00	0,08	0,08
DM 23	0,00	0,00	0,02
DM 24	0,00	0,03	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,02
DM 32	0,00	0,00	0,05
DM 43	0,04	0,08	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,03	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,03
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,04	0,00	0,03
DM 64	0,85	0,67	0,58
TOTAL	1,00	1,00	1,00

2012	*FListing*	*FS&M_AbAv*	*FS&M_BlAv*
DM 1	0,00	0,02	0,03
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,03	0,08
DM 22	0,00	0,08	0,08
DM 23	0,00	0,00	0,02
DM 24	0,00	0,03	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,02	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,02
DM 32	0,00	0,00	0,05
DM 43	0,04	0,08	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,03	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,02	0,03
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,02	0,00
DM 63	0,04	0,00	0,03
DM 64	0,85	0,67	0,58
TOTAL	1,00	1,00	1,00

Annex XXIII: Relative frequencies of disclosure methods by listing status and internationalization through sales, adjusted to control for industry effects

2005	*FListing*	*FS&M AbAv adj*	*FS&M BlAv adj*
DM 1	0,04	0,01	0,00
DM 5	0,04	0,00	0,00
DM 11	0,00	0,00	0,01
DM 16	0,00	0,00	0,01
DM 21	0,00	0,01	0,02
DM 22	0,00	0,09	0,02
DM 23	0,00	0,00	0,02
DM 24	0,00	0,01	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,01	0,00
DM 30	0,00	0,00	0,02
DM 31	0,00	0,01	0,00
DM 32	0,00	0,04	0,03
DM 43	0,04	0,06	0,03
DM 48	0,04	0,00	0,00
DM 56	0,00	0,02	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,00
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,01	0,00
DM 63	0,04	0,02	0,05
DM 64	0,81	0,70	0,77
TOTAL	1,00	1,00	1,00

2006	*FListing*	*FS&M AbAv adj*	*FS&M BlAv adj*
DM 1	0,00	0,03	0,02
DM 5	0,04	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,02	0,02
DM 22	0,04	0,10	0,05
DM 23	0,00	0,00	0,01
DM 24	0,00	0,01	0,02
DM 27	0,00	0,00	0,01
DM 29	0,00	0,01	0,00
DM 30	0,00	0,00	0,00
DM 31	0,00	0,00	0,03
DM 32	0,00	0,02	0,06
DM 43	0,04	0,06	0,03
DM 48	0,04	0,00	0,00
DM 56	0,00	0,02	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,00
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,01	0,00
DM 63	0,04	0,02	0,05
DM 64	0,81	0,67	0,70
TOTAL	1,00	1,00	1,00

2007	*FListing*	*FS&M AbAv adj*	*FS&M BlAv adj*
DM 1	0,00	0,03	0,02
DM 5	0,04	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,02	0,02
DM 22	0,04	0,12	0,04
DM 23	0,00	0,00	0,01
DM 24	0,00	0,01	0,02
DM 27	0,00	0,00	0,01
DM 29	0,00	0,01	0,00
DM 30	0,00	0,00	0,02
DM 31	0,00	0,00	0,01
DM 32	0,00	0,01	0,06
DM 43	0,04	0,06	0,03
DM 48	0,08	0,02	0,00
DM 56	0,00	0,02	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,00
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,02
DM 62	0,00	0,01	0,00
DM 63	0,00	0,00	0,03
DM 64	0,81	0,67	0,72
TOTAL	1,00	1,00	1,00

2008	*FListing*	*FS&M AbAv adj*	*FS&M BlAv adj*
DM 1	0,00	0,01	0,02
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,02	0,05
DM 22	0,00	0,12	0,05
DM 23	0,00	0,00	0,01
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,01	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,01
DM 32	0,00	0,01	0,03
DM 43	0,04	0,07	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,02	0,01
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,02
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,01
DM 62	0,00	0,01	0,00
DM 63	0,04	0,02	0,02
DM 64	0,85	0,68	0,70
TOTAL	1,00	1,00	1,00

Annex XXIII: Relative frequencies of disclosure methods by listing status and internationalization through sales, adjusted to control for industry effects

2009	*FListing*	*FS&M_AbAv_adj*	*FS&M_BlAv_adj*
DM 1	0,00	0,01	0,02
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,02	0,06
DM 22	0,00	0,12	0,06
DM 23	0,00	0,00	0,01
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,01	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,01
DM 32	0,00	0,00	0,03
DM 43	0,04	0,07	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,02	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,02
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,01	0,00
DM 63	0,04	0,02	0,04
DM 64	0,85	0,69	0,68
TOTAL	1,00	1,00	1,00

2010	*FListing*	*FS&M_AbAv_adj*	*FS&M_BlAv_adj*
DM 1	0,00	0,01	0,02
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,02	0,06
DM 22	0,00	0,12	0,06
DM 23	0,00	0,00	0,01
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,01	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,01
DM 32	0,00	0,00	0,04
DM 43	0,04	0,07	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,02	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,02
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,01	0,00
DM 63	0,04	0,02	0,02
DM 64	0,85	0,69	0,69
TOTAL	1,00	1,00	1,00

2011	*FListing*	*FS&M_AbAv_adj*	*FS&M_BlAv_adj*
DM 1	0,00	0,01	0,02
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,02	0,06
DM 22	0,00	0,12	0,06
DM 23	0,00	0,00	0,01
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,01	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,01
DM 32	0,00	0,00	0,04
DM 43	0,04	0,07	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,02	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,02
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,01	0,00
DM 63	0,04	0,02	0,02
DM 64	0,85	0,69	0,69
TOTAL	1,00	1,00	1,00

2012	*FListing*	*FS&M_AbAv_adj*	*FS&M_BlAv_adj*
DM 1	0,00	0,01	0,02
DM 5	0,00	0,00	0,00
DM 11	0,00	0,00	0,00
DM 16	0,00	0,00	0,00
DM 21	0,00	0,02	0,06
DM 22	0,00	0,12	0,06
DM 23	0,00	0,00	0,01
DM 24	0,00	0,02	0,02
DM 27	0,00	0,00	0,00
DM 29	0,00	0,01	0,00
DM 30	0,04	0,00	0,00
DM 31	0,00	0,00	0,01
DM 32	0,00	0,00	0,04
DM 43	0,04	0,07	0,05
DM 48	0,04	0,00	0,00
DM 56	0,00	0,02	0,00
DM 57	0,00	0,00	0,00
DM 59	0,00	0,01	0,02
DM 60	0,00	0,00	0,00
DM 61	0,00	0,00	0,00
DM 62	0,00	0,01	0,00
DM 63	0,04	0,02	0,02
DM 64	0,85	0,69	0,69
TOTAL	1,00	1,00	1,00